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The health status, mortality and service use of people with personality disorder in South East London

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A thesis submitted in fulfilment of the requirements for the degree of Doctor of Medicine (Research) by Publication at King's College London

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Table of Contents

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Summary of thesis

The overall aim of this thesis was to improve the knowledge of the public health burden of personality disorders in South East London, specifically as this relates to the health and mortality of individuals with personality disorders. An additional aim was to enhance the knowledge of the psychiatric service use of people with personality disorders in South East London.

This thesis addresses the above aims by focusing on four specific objectives. Each objective formed the basis of a discrete study.

1. To establish the life expectancy and all-cause mortality among secondary care patients with personality disorder
2. To establish the clinical predictors of all-cause and cause-specific mortality among secondary care patients with personality disorder
3. To establish the impact of co-morbid personality disorder on the service use of people with severe mental illness within secondary mental healthcare.
4. To use the SAPAS in order to examine the association between personality disorder screen status and general health in a local community sample

The thesis opens with an introduction chapter, **Chapter 1**, covering the relevant background literature – definition, classification and assessment of personality disorder. The current literature on epidemiology of personality disorder, in particular on health, mortality, costs and service use of people with personality disorder, is further expounded. Next, the chapter outlines the aims and objectives of the thesis, the sources of data used and my contribution to the work. In **Chapters 2, 3, 4 and 5**, the four studies, corresponding to the four defined objectives, are presented in the

form of published manuscripts. **Chapter 6**, the final chapter, presents a discussion of the findings, methodological considerations, implications for clinical practice and future research, and conclusions. The **References** section at the end of the thesis includes all bibliographic references from the Introduction (Chapter 1) and the Discussion (Chapter 6).

Abstract

Personality disorder is prevalent in the community and in clinical populations; it is among the most challenging of mental disorders, both to diagnose and to treat. Despite the rapid expansion of epidemiological research in personality disorders in recent years, substantial gaps remain in our knowledge of the public health burden of personality disorders.

This thesis aims to address this gap, by investigating the health, mortality experience, and service use of people with personality disorder. Four separate studies were carried out, using two discrete sources of data– one a large psychiatric case register, the other a community survey in South East London.

People with personality disorder in secondary mental health care experienced a significant reduction in life expectancy, compared to the general population; a subgroup of young people bore the highest risk. The majority of early deaths were from natural causes. Physical illness, substance and alcohol use, and functional impairment were significant clinical predictors of mortality. Amongst patients with severe mental illness, co-morbid personality disorder was independently associated with higher inpatient service use, and greater likelihood of involuntary hospitalization.

In the community, individuals at high risk of personality disorder were significantly more likely to be unemployed, have poorer health-related behaviours, multiple longstanding illnesses, and common mental disorders. However, personality dysfunction was independently associated with poor general health, over and above

these factors. This applied to clinically significant levels of personality dysfunction as well as sub-threshold personality dysfunction.

In conclusion, the findings give evidence of the burden of personality disorder in clinical and community populations. They underscore the importance of routinely assessing personality status in individuals presenting to general health services *and* mental health services. Moreover, clinicians and services should pay greater attention to the areas of physical health, drug and alcohol use, and functional impairment among people with personality disorder.

Abbreviations

ADL	Activities of Daily Living
CI	Confidence interval
CLPS	The Collaborative Longitudinal Personality Disorders Study
CRIS	Clinical Record Interactive Search System
DSM	Diagnostic and Statistical Manual of Mental Disorders
GP	General Practitioner
HoNOS	Health of the Nation Outcome Scales
ICD	International Classification of Mental and Behavioural Disorders
MSAD	The McLean Study of Adult Development
NESARC	National Epidemiological Survey on Alcohol and Related Conditions study
PJS	Patient Journey System
SAPAS	Standardized Assessment of Personality-Abbreviated Scale
SCID-II	Structured Clinical Interview for DSM-III-R Personality Disorders
SELCOH	South East London Community Health Study
SLAM	South London and Maudsley NHS Foundation Trust
SMI	Severe mental illness
SMI-PD	Severe mental illness with comorbid personality disorder
SMR	Standardized Mortality Ratio

List of Tables

Chapter 1 Introduction

Personality disorders are among the most challenging of all mental disorders, both to diagnose, and to treat and manage. The past two decades have seen some considerable changes in the field. Since the publication of the third edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III), epidemiological research in this area has rapidly expanded, alongside increasing attention on how psychiatric care succeeds or fails in helping these patients. Yet, little is currently known about the general health and mortality experiences of people with personality disorders and the impact of these issues on local services. As a trainee psychiatrist, I was interested in resolving some of the lack of knowledge about these matters in my local catchment area population.

1.1 Definition of Personality Disorder

There are two current operational definitions of personality disorder.

The International Classification of Mental and Behavioural Disorders (ICD-10) [1] defines personality disorder as:

'a severe disturbance in the characterological constitution and behavioural tendencies of the individual, usually involving several areas of the personality, and nearly always associated with considerable personal and social disruption'.

ICD-10 also stipulates that

'Personality disorder tends to appear in late childhood or adolescence and continues to be manifest into adulthood.'

The fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) [2] was replaced in May 2013 by the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) [3].

In contrast to DSM-IV-TR, which employed a multi-axial system and located personality disorders on a separate axis (Axis II) to all other mental disorders, DSM-5 has shifted to a single axis system. Thus, personality disorders are once again placed within the same axis as all other mental disorders . This change reflected a number of doubts about the validity of the distinction between the Axis II and Axis I disorders, and the apparently burdensome nature of a multiaxial classification system.

DSM-5 defines personality disorder as:
'an enduring pattern of inner experience and behaviour that deviates markedly from the expectations of the individual's culture, is pervasive and inflexible, has onset in adolescence or early adulthood, is stable over time, and leads to distress or impairment'.

The diagnostic criteria for personality disorders in DSM-5 (found in "Section II: Diagnostic Criteria and Codes" of DSM-5) have not changed from those in DSM-IV, and the classification of personality disorders retain the DSM-IV categorical approach with the same three 'clusters' and 10 personality disorders as in DSM-IV (see below). Thus the following outline of DSM-5 classification is essentially identical to DSM-IV. However, an alternative approach to the diagnosis of personality disorders, a hybrid dimensional-categorical methodology, was developed

for DSM-5 for further study and is presented as "Alternative DSM-5 Model for Personality Disorders", under Section III of DSM-5. This approach will be further described in the next section.

Like DSM-IV, DSM-5 recognizes three 'clusters' of personality disorder:

- Cluster A (the 'odd or eccentric' types): paranoid, schizoid and schizotypal personality disorder
- Cluster B (the 'dramatic, emotional or erratic' types): histrionic, narcissistic, antisocial and borderline personality disorders
- Cluster C (the 'anxious and fearful' types): obsessive-compulsive, avoidant and dependent.

Table 1.1 lists the specific personality disorders, as classified by ICD-10 and DSM-5. Of the 10 specific personality disorders in DSM-5, eight have a specific correspondence in ICD-10. For three of these eight categories, there are differences in nomenclature between the two systems; ICD-10 uses the term 'anankastic' instead of the DSM-5 'obsessive-compulsive', 'dissocial' instead of 'antisocial', and 'anxious/avoidant' instead of 'avoidant'. DSM-5 classifies borderline personality disorder as a specific category, whilst ICD-10 includes it as a subcategory of emotionally unstable personality disorder. One category of personality disorder, narcissistic personality disorder, has no equivalent in ICD-10. Finally, schizotypal personality disorder, which is classified under DSM-5 personality disorders, has no counterpart under ICD-10 personality disorders, but is considered to be equivalent to ICD-10's schizotypal disorder which is classified under *"Schizophrenia, schizotypal and delusional disorders"*.

Table 1.1 Comparison of classification of personality disorder in ICD-10 and DSM-5 (continued overleaf)

ICD-10 personality disorders	DSM-5 personality disorders	DSM-5 clusters
F60.0 Paranoid Personality Disorder	301.0 Paranoid Personality Disorder	Cluster A
F60.1 Schizoid Personality Disorder	301.2 Schizoid Personality Disorder	
No equivalent	301.22 Schizotypal Personality Disorder	
F60.2 Dissocial Personality Disorder	301.7 Antisocial Personality Disorder	Cluster B
F60.3 Emotionally Unstable Personality Disorder (with F60.30 impulsive type and F60.31 borderline type)	301.83 Borderline Personality Disorder	
F60.4 Histrionic Personality Disorder	301.50 Histrionic Personality Disorder	

No equivalent	301.81 Narcissistic Personality Disorder	
F60.5 Anankastic Personality Disorder	301.4 Obsessive-compulsive Personality Disorder	Cluster C
F60.6 Anxious [avoidant] Personality Disorder	301.82 Avoidant Personality Disorder	
F60.7 Dependent Personality Disorder	301.6 Dependent Personality Disorder	
F60.8 Other specific Personality Disorders	301.9 Personality Disorder Not Otherwise Specified	
F60.9 Personality Disorder, Unspecified		

1.2 Alternative DSM-5 model for personality disorders: a hybrid dimensional-categorical model

The alternative DSM-5 model aims to address certain shortcomings of the current approach to personality disorder classification. In the current approach, patients typically meet criteria for more than one of 10 specific personality disorders. It is also common for patients to be assigned a diagnosis of other specified or unspecified personality disorder, if they do not have patterns of symptoms that correspond with one and only one personality disorder.

In the alternative DSM-5 model, personality disorders are characterized by:

- impairments in personality *functioning;* and
- pathological personality *traits*.

This model retains six specific personality disorder types: antisocial, avoidant, borderline, narcissistic, obsessive-compulsive, and schizotypal. A diagnosis of personality disorder—trait specified (Personality Disorder-TS) can be made when a personality disorder is considered present but the criteria for a specific disorder are not met.

1.2.1 General Diagnostic Criteria for Personality disorder (Alternative DSM-5 model)

A. Moderate or greater impairment of personality (self/interpersonal) functioning.
B. One or more pathological personality traits.

C. The impairments in personality functioning and the individual's personality trait expression are relatively inflexible and pervasive across a broad range of personal and social situations.
D. The impairments in personality functioning and the individual's personality trait expression are relatively stable across time, with onsets that can be traced back to at least adolescence or early adulthood.
E. The impairments in personality functioning and the individual's personality trait expression are not better explained by another mental disorder.
F. The impairments in personality functioning and the individual's personality trait expression are not solely attributable to the physiological effects of a substance or another medical condition (e.g. severe head trauma).
G. The impairments in personality functioning and the individual's personality trait expression are not better understood as normal for an individual's developmental stage or sociocultural environment.

Early results from field trials show good test-retest reliability of borderline personality disorder diagnosis using this personality trait-defined diagnostic criteria [4].

1.3 Future classification of personality disorders in ICD-11

The publication of the ICD-11 reclassification of mental and behavioural disorders, including personality disorder, is expected in 2015. The details of the proposed changes to classification have already been published [5, 6] with the key changes being:

- Primary classification into four or five levels of personality pathology based on a single dimension of severity including mild, moderate and severe personality disorder.
- Identification of subthreshold level of personality difficulty, coded separately (under Z-codes) and not as a disorder.
- Secondary classification of likely five domains of personality disturbance: asocial/schizoid, dyssocial/antisocial, obsessional/anankastic, anxious/dependent, and emotionally unstable.
- Monothetic instead of polythetic criteria necessary for inclusion
- Simple diagnostic formulation with persistent interpersonal dysfunction at its core

The proposed classification places the severity of personality disturbance at the centre of classification. The dimensional approach is clinically intuitive and allows practitioners who have scarce time for detailed assessment to express a diagnosis at the level of severity only. The possibility of classifying subthreshold personality dysfunction is also potentially useful, and holds the potential advantage of destigmatizing personality difficulties. However, the loss of certain categories of personality disorders, particularly borderline and antisocial personality disorders (which both have a strong epidemiological evidence base), is problematic. Field testing is needed to show its reliability as a diagnostic system. Such substantial changes in classification may make it challenging for clinicians, researchers and policy makers, to track the prevalence of personality disorder over time, or to compare older studies with more recent studies in the field. On the other hand, having a system that encourages more consistent and acceptable diagnoses may lead to more high quality studies in the future.

Ultimately, to date, researchers and clinicians have failed to come up with a harmonised approach to the classification of personality disorder, which incorporates the thinking of both the World Health Organisation (i.e. ICD) and the American Psychiatric Association (i.e. DSM). Such a goal may be overly ambitious. Yet until international consensus on the classification of personality disorders is achieved, progress in this field is likely to move at a slower pace compared to other areas of medicine.

1.4 Assessment of personality disorder

Prior to DSM-III, published in 1980, assessment for personality disorder in psychiatric patients was frequently overlooked. Even when considered, personality disorder diagnosis was mostly based on clinical interview, which has face validity but crucially lacked reliability [7]. The presence of more acute and fluctuating psychiatric illness, or physical illness, can contaminate the assessment of the relatively more stable personality traits [8]. The lack of reliable case detection hindered progress in the field of clinical epidemiology in personality disorder, and recognition of this problem partially informed the rationale for creating a separate Axis – Axis II – in DSM-III for personality disorders. This approach was specifically designed to encourage consideration of personality in all clinical assessments, and to stimulate development in the field of personality disorder research. DSM-III also heralded the first appearance of clearly defined operational criteria for categories of personality disorder.

The publication of DSM-III stimulated the development of a number of structured assessments of personality disorders (see Table 1.4). In general, these assessments considerably improve the reliability of personality disorder diagnoses. The majority of the tabulated measures show satisfactory inter-rater reliability, at least when the instruments are used by their developers. In a review of 15 reliability studies, Zimmerman [8] found that the unweighted mean κ coefficient of inter-rater reliability was 0.75 for any personality disorder (range: 0.62 for paranoid personality disorder to 0.77 for antisocial personality disorder). In contrast, test-retest reliability coefficients for personality disorder measures are generally lower. The length of follow-up interval seems to affect reliability, although the effect appears to vary by

personality disorder category, with antisocial personality disorder being the most robust category. Zimmerman (1994) reported an unweighted mean κ for test-retest reliability of 0.56 for any personality disorder in the aforementioned review of reliability studies (range: 0.11 for schizotypal to 0.84 for antisocial). A subsequent review of four further test-retest reliability studies [9] reported reliabilities consistent with Zimmerman's review.

Table 1.4 Assessment methods for all personality disorders (continued overleaf)

Instrument	Authors	Method	No. of items
Personality Assessment Schedule (PAS)	Tyrer *et al* (1979) [10]	Semi-structured interview with informant(s) using ICD-9 criteria (ICD-10 and DSM-IV version now available)	24
Millon Clinical Multiaxial Inventory (MCMI-II)	Millon (1987) [11]	Self-report by patient using DSM-III-R criteria (DSM-IV-TR version now available)	175
Structured Interview for DSM-III Personality Disorders (SIDP)	Pfohl *et al* (1983) [12]	Semi-structured interview with patient or informant(s) using DSM-III criteria (DSM-IV version now available)	160
Diagnostic Interview for Personality Disorders (DIPD)	Zanarini (1983) [13]	Semistructured interview with patient using DSM-III-R criteria (DSM-IV version now available)	101
Personality Diagnostic Questionnaire-Revised (PDQ-R)	Hyler & Rieder (1987) [14]	Self-report by patient or informant(s) using DSM-III-R criteria	152
Wisconsin Personality Inventory (WISPI)	Klein (1985) [15]	Self-report by patient using DSM-III-R criteria (DSM-IV verson now available)	360
Tridimensional Personality Questionnaire (TPQ)	Cloninger (1987) [16]	Self-report by patient	100
Structured Clinical Interview for DSM-III-R Personality Disorders (SCID-II)	Spitzer *et al* (1987) [17]	Semi-structured interview with patient using DSM-III-R criteria (DSM-IV version now available)	120

Instrument	Authors	Method	No. of items
Standardised Assessment of Personality (SAP)	Pilgrim & Mann (1990) [18]	Semi-structured interview with informant(s) using ICD-10 & DSM-III-R criteria	N/A
International Personality Disorder Examination (IPDE)	Loranger *et al* (1994) [19]	Semi-structured interview with patient using ICD-10 & DSM-III-R criteria	157
Assessment of DSM-IV Personality Disorders Questionnaire (ADP-IV)	Schotte *et al* (1998) [20]	Self-report by patient using a 7-point trait scale and a 3 point distress scale	94
Iowa Personality Disorder Screen (IPDS)	Langbehn *et al* (1999) [21]	Brief self-report screening questionnaire designed for use in busy medical settings	11
Schedler-Westen Assessment Procedure (SWAP-200)	Westen & Schedler (1999) [22]	Q-sort method of personality assessment designed for use by a clinician/observer	200

1.4.1 Personality disorder screening in clinical practice and epidemiology

The structured clinical interview is regarded as the most robust method of assessing personality disorder. However, structured interviews are usually time-consuming, thus are mostly impractical for busy clinical settings, such as GP surgeries and community psychiatric teams. Ironically these are the very settings where the possible presence of personality disorder needs to be considered routinely and detected early. This is because personality disorder significantly affects the management and outcome of associated health problems, both psychiatric [23, 24] as well as concurrent medical illness [25].

Brief screening tools [21, 26] offer a pragmatic solution, allowing consideration of personality disorder to be easily incorporated into a standard clinical assessment. Individuals identified at screening to have likely personality disorder can proceed to have this confirmed or rejected by a fuller diagnostic assessment. Germans et al [27] studied the characteristics and performance of eight different personality disorder screening instruments in predicting personality disorder against SCID-II as "gold standard", in three random samples of psychiatric outpatients. The Standardized Assessment of Personality-Abbreviated Scale (SAPAS) showed the best performance, with respect to percentage correctly classified (81%) and test-retest reliability (0.89).

1.5 Epidemiology of Personality Disorder

This section reviews the current literature on the epidemiology of personality disorder. The following areas will be covered:

1. Prevalence in the general population and in clinical populations.
2. Socio-demographic correlates of personality disorder.
3. Natural history of personality disorder.
4. The health of people with personality disorder.
5. The mortality risk of people with personality disorder.
6. The economic cost and health service use of people with personality disorder.

1.5.1 Prevalence

Various community surveys have found a prevalence of personality disorder of approximately 6-10%. The figure is higher in psychiatric settings, yet without routine structured evaluation it is often under-diagnosed clinically. Diagnostic thresholds and methodological factors also explain the variation in estimates that have been obtained.

1.5.1.1 General population / Community

In Samuels' 2011 large review of community surveys of personality disorders published since 2000, the prevalence of personality disorder was estimated at 6-10% [28]. Cluster C personality disorder was more prevalent than clusters A and B. This is generally consistent with findings from earlier studies [29, 30]. The author noted that the ICD-10 estimates of any personality disorder were about half that of estimates based on DSM-IIIR or DSM-IV, and that this difference was most

pronounced for histrionic, dissocial (antisocial), and anxious/avoidant disorders. The author of the review ascribed this difference to varying diagnostic thresholds, i.e the generally greater proportion of criteria required by the ICD-10 for the diagnosis of a personality disorder compared to DSM-IV. Support for this explanation is also found in a re-analysis of data from the US National Epidemiological Survey on Alcohol and Related Conditions (NESARC) study [31].

From a wider perspective, in the largest global survey of DSM-IV personality disorder to date (and as part of the World Health Organization World Mental Health (WMH) Surveys, carried out across 13 countries, including low- and middle-income as well as developed countries), Huang and others found prevalence estimates of personality disorder ranging from 2.4% to 7.9%, with a mean prevalence of 6.1% [32].

1.5.1.2 Clinical populations

The prevalence of personality disorder is higher in clinical populations, and varies according to the nature of the clinical setting. Among UK primary care attenders, about a quarter meet criteria for personality disorder [33]. In secondary mental health care settings, the figure is even higher. A recent review of clinical epidemiological studies, covering inpatient and outpatient psychiatric settings, found that approximately half of the patients in these settings have a personality disorder [34]. A study of across four urban UK community mental health teams estimated the prevalence of personality disorder to be as high as 40% [35]; these high prevalence estimates in clinical settings have been replicated in a large number of cross-sectional surveys conducted in many other parts of the world.

1.5.2 Sociodemographic Correlates

Age and gender associations of personality disorder across the abovementioned epidemiological studies show some inconsistencies as well as commonalities. In the UK, any personality disorder and also Cluster B personality disorders appear to occur more frequently among men and younger age groups, but there are no clear age or gender differences in relation to the prevalence of Clusters A and C [36]. One of the largest US surveys of personality disorder, the US National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), found that any personality disorder, schizoid, antisocial and narcissistic personality disorders were more common in men, whilst paranoid, schizotypal, borderline, histrionic, and all cluster C personality disorders were more common among women [31, 37]. Contradicting these findings, a large Norwegian survey found no gender influence on the prevalence of 'unspecific personality disorder' [38]. In the aforementioned global survey of personality disorder by Huang et al, any personality disorder, clusters A and C personality disorder appeared to be more common among men, and cluster B was equally prevalent among men and women; the prevalence of any personality disorder was inversely related to age, and more specifically clusters A and B, but not C [32]. In a large Australian National Survey, persons with personality disorder were more likely to be younger, and male; impulsive personality disorder and anankastic personality disorder were more prevalent among men, anxious personality disorder and dependent personality disorder were more prevalent among women, and other categories were equally prevalent in both sexes [39].

Although perhaps axiomatic, surveys repeatedly show that compared to people without personality disorder, individuals with a personality disorder are more likely to report experiencing social problems such as marital difficulties and unemployment [36, 40, 41]. They are more likely to be unmarried, to be living alone, and less likely to own their accommodation [36, 38, 39, 41, 42]. Compared to those without personality disorder, they are significantly more likely to be functioning at a lower level, an association which appears to be independent of the effects of depressed mood [43]. They are also more likely to report a previous history of alcohol and drug problems and to report experiencing a greater number of life events.

In terms of education, analyses of associations by personality disorder cluster have seen mixed results, where clusters A and B have been variously associated with lesser, and cluster C has been associated with higher, education attainment [37, 38]

1.5.3 Natural history of personality disorder

Longitudinal studies provide key data about the course and natural history of a disorder. In the area of personality disorder, three key longitudinal studies have yielded important information on the course and development of personality disorder, and these are summarised below.

The Children in the Community (CIC) Study [44] provided knowledge into childhood risk factors for and the development of personality disorder in adolescence and early adulthood. The study tracked the developmental trajectories of about 800 youths in New York state, with repeated measures over 20 years. In terms of change

and stability of personality disorder symptoms, the authors found that the prevalence of personality disorder symptoms or disorders was highest in early adolescence with a decline between adolescence and adulthood [45]; some of this decline was attributed to normal developmental declines in impulsivity, attention seeking, and dependency. About one-fifth of the sample had an overall increase in personality disorder symptoms over the follow-up period. Over time, youths at the extreme end of personality disorder problems showed increasing deviance relative to their peers. Key early risk factors included family characteristics (socioeconomic status, parental conflict, parental illness or death), parenting style and the quality of early parent-child relationships [44, 46]. Comorbidity with Axis I disorders was generally an indicator of greater longer-term impairment and poor prognosis.

The Collaborative Longitudinal Personality Disorders Study (CLPS) [47] is a prospective, repeated measures study, which originally set out to test the stability of personality disorders in a treatment-seeking adult population. The original study sample included treatment-seeking patients with schizotypal, borderline, avoidant, and obsessive-compulsive personality disorder, as well as those with major depression and no personality disorder. The study found that remission (defined as at least 12 consecutive months of fulfilling no more than two baseline personality disorder criteria) among patients with personality disorder was common and was observed in more than half of all patients with personality disorder within the first two years of follow-up. Temporal stability of personality disturbance was much higher when a dimensional approach was taken to measuring personality disturbance.

Regarding comorbidity with Axis-I disorders, the course of personality disorder was relatively independent of changes in the course of Axis I disorders, with the exception of borderline personality disorder and major depression and post-traumatic stress disorder (PTSD), and avoidant personality disorder and social phobia. Of note, impairment of social functioning was found to be more enduring than psychopathology in individuals with personality disorder [48]. Over a 10-year course, patients with borderline personality disorder had high rates of remission (85%), but severe and persistent impairment in social functioning [49].

The McLean Study of Adult Development (MSAD) [50] is a prospective study of the course and outcome of borderline personality disorder. The study originally recruited 378 patients with borderline personality disorder along with 72 patients with other Axis II disorders, excluding borderline personality disorder. All patients were recruited at their index psychiatric admission, and all patients were repeatedly followed-up at 2-yearly intervals over two decades. Over time, remission was defined as no longer meeting criteria for borderline personality disorder (on Revised Diagnostic Interview for Borderlines and DSM-III-R) or another personality disorder (DSM-III-R) for a period of two years or more (or one follow-up period). Recovery was defined as a Global Assessment of Functioning score of 61 or higher – when operationalized, this is broadly equivalent to an individual being in remission from his or her primary personality disorder (Axis II) diagnosis, having at least one emotionally sustaining relationship with a close friend or life partner/spouse, and being able to work or go to school consistently, competently, and on a full-time basis. Using these definitions, at 16-year follow-up, high rates of remission were seen in both borderline personality disorder participants and Axis II comparison

participants (range for borderline participants: 78%–99%; range for Axis II comparison participants: 97%-99%), but rates of recovery were lower in the borderline group (40%–60% compared with 75%–85%). However, symptomatic recurrence and loss of recovery occurred more rapidly and at substantially higher rates among borderline patients than Axis II comparison subjects (recurrence: 10%–36% compared with 4%–7%; loss of recovery: 20%– 44% compared with 9%–28%).

Taken together, the findings from both the CLPS and MSAD studies show that whilst symptomatic remission is common in the longitudinal course of personality disorder, sustained improvement in social functioning is harder to attain, especially in those with borderline personality disorder. Indeed enduring impairment in social functioning appears to be a defining characteristic of all personality disorders. Beyond the immediate impact on the ability to work and sustain relationships, little is known about the longer-term impact of this impairment on an individual's health and their use of services. One recent study provides an insight and in a large community sample found an incremental association between severity of personality disturbance and the extent of social difficulties including contacts with the criminal justice system, economic inactivity, more Axis I pathology and greater service contact [51].

1.5.4 The health of people with personality disorder

A literature search was conducted using MEDLINE, Pubmed, and Google Scholar in order to identify previously published studies examining the association between personality disorder and physical and mental health. The following search terms were used 'Personality disorder', 'health', 'physical health', 'medical illness', 'co-

morbid', 'comorbidity' and the search limited to English-language articles, up until August 2013. The literature search was supplemented by a hand search of references cited in relevant review articles. For studies concerning mental health and personality disorder, studies were included if they examined personality pathology or personality disorder, and prevalence, comorbidity or outcome in a major mental illness (depression, bipolar disorder, psychosis). For studies concerning physical or general health, studies were included if they examined personality pathology or personality disorder, and a medical condition or a measure of physical or general health, functioning, or well-being.

1.5.4.1 Comorbidity with other mental disorders

There is a growing interest and literature on the influence of co-morbid personality disorder on the outcome of Axis I disorders. Samuels' 2011 review [28] of community studies found strong unconfounded associations between personality disorders and a wide range of other mental disorders, including anxiety disorders, affective disorders, substance use disorders and psychosis. Consistently, studies have found that among the three DSM clusters, axis I co-morbidity occurs more frequently among individuals from the cluster B personality disorder subgroup.

The best studied association has been between depressive disorders and personality disorder status [23]. The question of influence of personality disorder on outcome in depressed patients has been the subject of a review by Mulder [52], and a more recent meta-analysis by Newton-Howes et al [53]. Whilst Mulder's review showed that the best designed studies show little or no difference in outcome between depressed patients with and without personality disorder, the meta-analysis of 34

studies by Newton-Howes et al concluded that personality disorder has a significant association with poorer outcome in depression (pooled odds ratio 2.18; 95% confidence interval 1.70-2.80). A recent community study by Skodol et al [54] investigated the role of personality disorders on the 3-year course of major depression and found that borderline personality disorder robustly predicted persistence of major depression, whilst other specific personality disorders did not.

Personality disorder is also prevalent among patients with severe mental illness (SMI) [55]. Among patients with psychosis, co-morbid personality disorder is associated with increased risk of violence [56], and suicidal behaviour [57]. Regarding Bipolar disorder, a review by Fan and Hassell [58] concluded that bipolar patients with personality psychopathology have poorer response to medications and a more turbulent course of illness. The literature on the impact of co-morbid personality disorder on the course of schizophrenia is more limited, with mixed findings [59, 60]. Notwithstanding, from a service utilisation perspective, studies of cohorts of patients with SMI have found that those with co-morbid personality disorder tend to spend greater periods of time in hospital [61, 62].

1.5.4.2 Comorbidity with physical illness

Comparatively little attention has been paid to investigating physical health and physical morbidity in individuals with personality disorders. This marks an area of relative neglect from a research perspective. For instance, a large body of empirical research has now established depression as a risk factor for cardiovascular disease, and is motivating the health profession to address this seriously [63]. In severe mental illness, studies providing evidence of poor general health, increased

cardiovascular risk and risk of diabetes, and increased cancer mortality, all underline the need for effective physical health care as a priority action in this population [64]. A focus and awareness of physical health issues in the field of personality disorder research and clinical practice is however still in its infancy. Very few studies have considered this association alongside a comprehensive range of potential confounding factors. Moreover, the possible impact of response bias as an explanation for the association between personality disorder and poor health has not been fully explored.

Two review articles have addressed the relationship of personality disorder and physical illness. Frankenburg's 2006 review on personality disorder and medical comorbidity [25] found that in general, those with personality disorders do not feel as 'fit' as others do. The review found that those with active (as opposed to remitted) borderline personality disorder, personality disorder that is comorbid to axis I disorders, and antisocial personality disorder, were all likely to have more medical problems. Furthermore, personality disorders can complicate the course of chronic medical illnesses, through more disordered health behaviours and/or greater difficulty complying with treatment. The use of multiple psychotropic medications is not uncommon amongst patients with personality disorder, and this in itself can be associated with health risks (e.g weight gain and diabetes with atypical antipsychotic agents).

The aforementioned 2011 review of community studies by Samuels [28] also found personality disorder to be associated with medical service use, and medical

morbidity and mortality, especially related to cardiovascular disease. The key reviewed studies and other recent studies are detailed below.

Data on the association between personality disorder and poor physical health has emerged from cross-sectional surveys and also longitudinal studies.

1.5.4.3 Cross-sectional surveys examining the association between health and personality disorders

In the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), a US population-based survey of over 40,000 adults aged 18 and over, personality disorder was significantly associated with current alcohol use disorder and current drug use disorder (16.4% had a current alcohol use disorder and 6.5% had a current drug use disorder) [65] A further substudy of the NESARC population detected a specific association between antisocial personality disorder and substance use disorders [66]. Associations with alcohol and substance use problems are not in themselves direct indicators of poor health, although they are linked with health problems. Hence personality disorder may be linked with poor health through alcohol and substance use.

In the Australian National Mental Health and Well-Being Survey, a survey of 10,641 people randomly sampled from the general population [67], the presence of personality disorder was robustly and independently associated with having one or more days out of role functioning in the past 4 weeks (OR = 6.3), even after adjusting for the effects of Axis I and physical co-morbidity. The severity of disability increased with the number of personality disorders present. Moreover,

each specific personality disorder was strongly associated with one or more measures of disability [67, 68]. The key limitation of the study however was the lack of accounting for important health-related confounding factors such as smoking, alcohol and substance use, exercise, and obesity.

Moran et al [69] conducted the first study of the association between personality disorder and cardiovascular disease, using a national household survey of over 8000 adults living in England, Wales and Scotland. Those individuals screening positively for the presence of personality disorder were more likely to experience a stroke or ischaemic heart disease, even after adjusting for key cardiovascular risk factors (hypertension, diabetes, smoking and alcohol use). The impact of concurrent depression or other mental disorders, however, was not accounted for in this study.

El-Gabalawy et al [70] used data from the NESARC to study the association between borderline personality disorder and physical health conditions in the community. After adjusting for sociodemographic variables, common Axis I mental disorders, and nonborderline personality disorders, borderline personality disorder was significantly associated with a number of medical conditions, including arteriosclerosis or hypertension, hepatic disease, cardiovascular disease, gastrointestinal disease, arthritis, venereal disease, and "any assessed medical condition". This study used a large, population-based sample, but the findings are limited to borderline personality disorder alone, and confounding by health behaviours was not accounted for.

Powers and Oltmanns studied personality disorder and physical health in an epidemiologically-based sample of 608 middle-aged (55-64 years) adults in St. Louis (in Missouri, USA), and found that disordered personality was significantly predictive of worse physical functioning, role limitations, fatigue and pain at both baseline and 6-months, even when current health problems, the presence of depression, and health behaviours (i.e., smoking, drinking, exercise) were controlled for [71]. Nonetheless, these findings have limited generalizability to the general adult-age population.

An association between personality and health may be explained by differential reporting of poor health among those with certain personality features. Goodwin and Engstom examined this possibility in a representative adult community sample of over 3000 individuals; some support for this hypothesis was found, in that personality factors (as measured by the Midlife Development Inventory Personality Scales (MIDI), based on the 'big five' factor model) were found to predict perception of health, in both the presence and absence of medical conditions [72]. A limitation is that common mental disorders were classified with all other medical conditions (as the outcome variable) and thus the possible link between personality, anxiety or depression, and general health was not examined.

1.5.4.4 Longitudinal studies examining the association between health and personality disorders

Further insights into the association between personality disorder and poor physical health have emerged from longitudinal studies of people with personality disorders. In the Collaborative Longitudinal Personality Disorders Study (CLPS), co-morbid

personality disorder in the context of current depression was associated with greater impairment in terms of role limitations due to emotional problems, social functioning and a lower perception of general health [73]. The presence or absence of chronic medical illnesses, and health-related lifestyle factors were not assessed. In the McLean study (MSAD), nonremission of borderline personality disorder (compared to remitted borderline personality disorder) was associated with a heightened risk of reporting functional syndromes (i.e. chronic fatigue, fibromyalgia, or temporomandibular joint syndrome) and chronic medical conditions (i.e. obesity, osteoarthritis, diabetes, hypertension, back pain, urinary incontinence). In addition, nonremitted borderline patients were more likely to report poor health-related lifestyle choices (regular smoking and alcohol drinking, and lack of exercise) and regular use of pain medication or sleep medication [74]. It should however be noted that both the CLPS and MSAD studies were carried out in clinical, help-seeking samples of patients with specific categories of personality disorder, thus limiting generalizability to the general population.

1.5.5 The mortality of people with personality disorder

Given the impact of personality disorder on health, the mortality of people with personality disorder warrants greater attention than it has hitherto been given. Consistent with the other indicators of the public health impact of personality disorder, the condition appears to be associated with a substantial burden of mortality. However, methodological issues in the existing literature limit its utility and generalizability to present day populations. Moreover, nothing is currently known about the clinical predictors of mortality among people with personality disorder.

A list of psychiatric mortality studies including personality disorder was compiled through MEDLINE, Pubmed and Google Scholar literature searches. 'Personality disorder', 'psychiatric', 'mental disorder', 'mortality', 'death', and 'life expectancy' were entered as search terms and the search limited to English-language articles. The literature search was supplemented by a hand search of references cited in relevant review articles. This section reviews the findings from these studies, with a particular focus on mortality in personality disorder.

In general terms, mental disorder per se is an established risk factor for increased mortality [75-77]. People with mental disorders die prematurely for a variety of reasons, including poor physical health [78, 79], adverse physiological consequences of long-term psychotropic medication, unhealthy lifestyle, as well as increased death rates as a result of suicide, accidents and homicide [80, 81]. The risk of increased mortality has been shown to vary according to type of mental disorder, with substance use disorders conferring a particularly high risk of early death [75, 80, 82, 83].

A number of studies have previously reported the existence of an association between personality disorder and raised mortality, from both natural and unnatural causes [80, 83-90]. Harris and Barraclough's 1998 review of mortality in mental disorder [75] identified two papers with data on personality disorder, from Iowa in the US and from Israel respectively [86, 90]. The combined sample size of personality disorder patients was around 1800, in which the risk of death from all causes was 1.8 times that expected in the reference population (Standardized

Mortality Ratio (SMR) =184). SMR for unnatural deaths was 371 (accounting for 52% of excess deaths), and SMR for natural deaths was147 (48% of excess deaths). Both studies used inpatient samples and ICD-9 / pre-DSM-III Personality Disorder diagnoses, and therefore the generalizability of these findings to present day clinical populations is questionable.

Further studies reporting on the association between personality disorder and mortality, that have been published since 1990 are summarised in Table 1.5.5.

Table 1.5.5 Mortality of personality disorder from published studies (continued overleaf)

Author	Location	Sample (personality disorder sample size)	Length of follow up	Mortality of patients with personality disorder
Black *et al* (1985) [91]	Iowa, US	All inpatients of university psychiatric hospital admitted in 1972-81. N= 900 patients with ICD-9 Personality and sexual disorders	10-year study period	Excessive unnatural deaths (males SMR 4.55, female SMR 17.81), but not natural deaths. All cause male SMR 1.17, female 1.52
Zilber *et al* (1989) [86]	Israel	All hospitalized psychiatric patients in Israel in 1978. ICD-9 Personality Disorder patients made up 4700 person-years, with 35 observed deaths over the study period.	6-year study period	Overall SMR 2.66, males 2.75, females 2.46. Age-specific SMRs: 20-39y: 6.89, 40-59y: 2.20, 60-69y: 0.63, 70+: 1.11 Cause specific SMRs: Natural cause 3.15 ($p<0.01$) Suicide 2.58 (not significant) Other unnatural 1.16
Baxter (1996) [88]	Salford, UK	Individuals on psychiatric case register between 1969-1975. 778 patients with ICD-9 Personality Disorder diagnosis.	Up to 18 years observation period	Overall SMR 2.07 ($p<0.0001$)

Author	Location	Sample (personality disorder sample size)	Length of follow up	Mortality of patients with personality disorder
Lawrence *et al* (2000) [85]	Western Australia	People receiving mental health services (in-, out- and day patients) in 1980-95. Total n=4400. Unknown number of ICD-9 Personality Disorder patients	15 year observation period (1980-95)	Mortality rate ratio: male 2.14 (95% CI 1.68-2.73); female 2.25 (1.71-2.94)
Hiroeh *et al* (2001 & 2008) [80, 83]	Denmark	Psychiatric case register inpatients in 1973-93. Total n=257,720. ICD-8 Personality Disorder females 205211 person-years; males 181404 person-years	21-year observation period	Suicide: female SMR1568 (95% CI 1471-1672), male SMR1198 (1128-1272). Homicide: female SMR 782 (95% CI 499-1226), male SMR 536 (311-922) Accidents: female SMR 465 (95% CI 404-535), male SMR 406 (361-455) Natural deaths: female SMR 177 (95%CI 170-185), male SMR 187 (179-196) Elevated SMRs for all specific natural causes of death, except for deaths from neoplasms in males.

Author	Location	Sample (personality disorder sample size)	Length of follow up	Mortality of patients with personality disorder
Hannerz *et al* (2001) [92]	Sweden	Swedish psychiatric inpatients 1978-82. N=2229 ICD-8 Personality Disorder patients.	5-year study period	Both men and women have reduced life expectancy at all ages. At age 40, life expectancy is 12 years less for patients with personality disorder.
Kisely *et al* (2005) [87]	Nova Scotia, Canada	Mentally ill patients in psychiatric care or primary care across Nova Scotia 1995-2000. Total n=221048. Unknown number of ICD-9 Personality Disorder patients.	5-year study period	Mortality rate ratios: Overall: males 2.04 (95% CI 1.27-2.79), females 2.08 (1.10-3.04) Psychiatric care: males 2.28 (95% CI 1.29-3.25), females 2.17 (0.49-3.80) Primary care: males 1.13 (95% CI 0.34-1.90), females 2.05 (0.80-3.28)
Tidemalm *et al* (2008) [84]	Stockholm County, Sweden	Individuals with long-term mental disorder (6 months or more) requiring psychiatric care or social service support in 1997. Diagnosis specific SMRs amongst psychiatric inpatients	3-year observation period	Deaths by external causes: male SMR 20.5 (95%CI 11.9-32.8), female SMR 29.1 (15.5-49.8) Suicide mortality: male SMR 37.6 (21.5-61.0), female SMR 41.7 (20.8-74.7)

Author	Location	Sample (personality disorder sample size)	Length of follow up	Mortality of patients with personality disorder
		only. Total n=7740. Unknown number of ICD-10 Personality Disorder patients		
Grigoletti *et al* (2009) [93]	South Verona, Italy	All psychiatric patients in community-based mental healthcare system over 1982-2001. ICD-10 Personality Disorder patients made up 3627 person years	20-year study period	Overall SMR 2.74 (95% CI 2.0-3.7)

All studies displayed in the Table found raised mortality in patients with a diagnosis of personality disorder, with all-cause SMRs ranging from 1.2 to 2.8. Across the studies, the risk of premature all-cause mortality appears to afflict men and women with personality disorder equally. However, women with personality disorder have consistently higher mortality risks for unnatural deaths compared to men with personality disorder. Regarding natural cause deaths, differing findings emerge from the three studies providing such data. Black *et al* [90] found no increased risk of natural deaths in personality disorder, whereas Zilber *et al* [86] reported an overall natural death SMR of 3.15; Hiroeh [83] found an increased risk of natural deaths in both men and women with personality disorder.

The aforementioned studies have some key limitations. Most studies carried out pre-2000 suffer from two factors that limit the generalizability to present day clinical personality disorder populations – a) use of ICD-8 or ICD-9 Personality Disorder diagnoses, and b) exclusive use of inpatient samples. ICD-10 Personality Disorder classification has major differences with previous ICD versions and it is difficult to know whether findings based on ICD-8 or ICD-9 diagnostic data are applicable to present day samples. The sole use of inpatient samples, in all but three of the studies, means likely selection bias towards more severely unwell patients and thus a probable overestimation of overall mortality risk in personality disorder. One study suffered a sizeable loss to follow-up of 11% of personality disorder patients [88], which may lead to under-estimation of overall mortality, given that loss to follow-up may be due to more severe or complex psychopathology, physical illness, or unrecorded mortality. Only one study reported on life expectancy [92] – a key public

health metric – but again ICD-8 diagnoses were used and the relevance of the findings to the present day is unclear.

Moreover, beyond the knowledge that people with personality disorder are at increased risk of premature mortality, little is known about the clinical predictors of mortality amongst this group. Follow-up studies in personality disorder have almost exclusively examined deaths from suicide, particularly within borderline personality disorder [94, 95]; among this group, depression, substance use disorder and antisocial personality disorder (or traits) are associated with higher risk of completed suicide. However, despite the increasing recognition of medical comorbidity in personality disorder [25, 28], and of the role of natural causes underlying excess mortality in all people with mental disorders [96-98], no previous study has investigated deaths from natural causes among people with personality disorder.

1.5.6 The economic cost and health service use of people with personality disorder

It is important to chart patterns of health service use and the associated economic costs, in order to inform decision-making both about future resource allocation and also the design and delivery of health services. Given the physical and psychiatric impact of personality disorder, one might anticipate high levels of service utilisation and associated economic burden. Indeed, the current literature suggests that, both at a population level and at the level of clinical services, the burden of personality disorder may be as high as that of Axis I disorders. However, it remains unclear whether this association is predominately confounded or mediated by co-morbid Axis I disorders. In addition, the factors underlying an association between co-

morbid personality disorder and increased service use in patients with severe mental illness are not well understood.

A literature search for into this area was conducted using MEDLINE, Pubmed and Google Scholar. 'Personality disorder', 'service use/utilization', 'treatment use/utilization', 'cost', 'impact', and 'burden', were entered as search terms and the search limited to English-language articles. The literature search was supplemented by a hand search of references cited in relevant review articles. Studies were included if they examined personality disorder or comorbid personality disorder in an Axis I condition, and its association with any aspect of health care use.

Considering the economic burden firstly at a macro-level, a major report commissioned by the King's Fund on National Health Service (NHS) mental health spending in England examined the current and future cost of a number of mental disorders, including personality disorder, at a population level [99]. The estimated number of people with personality disorders in 2007 was 2.47 million, with total service costs estimated to be £704 million. The inclusion of lost employment costs, which is thought to account for over 90% of total costs, brings this figure up to £7.9 billion. By 2026, this figure is estimated to be £12.3 billion. This is similar to projected costs of depression and anxiety disorders, and considerably higher than that of schizophrenic disorders and bipolar disorder.

Micro-level economic data is more sparse, although a few studies have shed light on the patterns of service use by people with personality disorder and these are outlined

below.

Both the Australian and British national surveys of psychiatric morbidity reported data pertaining to the economic impact of personality disorder. In the Australian national survey [67], personality disorder was a predictor of visits to GPs, psychiatrists and psychologists, over and above other mental disorders and physical conditions. Regarding GP visits, personality disorder was a predictor of consultations for mental but not physical health problems. A further analysis examining individual subtypes of personality disorder [68] found that borderline personality disorder predicted mental health consultations with GPs; whereas people with paranoid, histrionic and dependent personality disorder were least likely to seek mental health consultations with psychiatrists. Overall, having more than one personality disorder was associated with increased odds of consulting a psychologist or psychiatrist, with the exception of comorbid personality disorder in borderline personality disorder, which reduced the likelihood of consultations. In Coid *et al*'s national study of the prevalence of personality disorder, personality disorder was not independently associated with healthcare service use over and above demographic and Axis I disorders [36]; however, cluster C personality disorder was associated with counselling and psychotropic medication prescription.

Powers and Oltmanns' epidemiologically based study (mentioned in section 1.5.4.3) found that personality disorder features, specifically features of borderline personality disorder, were predictive of greater healthcare utilization and prescription medication use—an association which did not extend to clusters A and C personality disorders [71]. The generalizability of these findings is limited by the

fact that the study population was restricted to a middle-aged sample.

A handful of studies in primary care have found that personality-disordered primary care patients make more visits to hospital and receive more referrals to secondary care [100-102]. However, some of these only examined the effect of borderline personality disorder in selected non-random samples of patients [100, 101], and suffered from low response. Therefore, selection and response bias cannot be ruled out as explanations for the findings from these studies. Moran and colleagues studied the impact of all categories of personality disorder in a cohort of 374 consecutive primary care attenders, and found that personality disorder in general was independently associated with frequent attendance to general practice and fewer referrals to secondary care [103]. Yet in a subsequent economic analysis of service costs, personality disorder was not independently associated with increased costs; the increased costs were explained by an interaction between personality disorder and common mental disorders [104].

Turning to studies derived from secondary/hospital settings, Bender and others retrospectively examined the treatment histories of 664 treatment-seeking patients in four personality disorder groups -- schizotypal, borderline, avoidant, and obsessive-compulsive -- and in a comparison group of patients with major depressive disorder, who were recruited as part of the Collaborative Longitudinal Personality Disorders Study (CLPS) [105]. They found that patients with personality disorder had more extensive histories of psychiatric outpatient, inpatient, and psychopharmacologic treatment than patients with major depressive disorder and no personality disorder. Specifically, patients with borderline personality disorder used most treatments in

greater amounts compared to depressed patients or patients with other personality disorders. A further, prospective study of treatment patterns in the same cohort essentially confirmed these findings [106]. Over a three-year follow-up period, patients with borderline personality disorder were significantly more likely than those with major depressive disorder and no personality disorder, to have used more mental health treatment resources of various types, including individual therapy, emergency department visits, hospitalizations, and number of days hospitalized. The obsessive-compulsive personality disorder group was significantly more likely than those with major depressive disorder and no personality disorder to have received individual therapy, but less likely to have visited an emergency department; the avoidant personality disorder group was more likely to have received individual treatment; the schizotypal personality disorder group was more likely to receive psychiatric medications [106]. These differences were not explained by the presence of potential confounders including co-morbid psychiatric problems, or socio-demographic factors.

A Dutch study of 1740 patients with personality disorder under mental healthcare institutes examined the cost incurred to medical services and from lost productivity at work in the 12 months prior to treatment [107]. Within medical costs, those due to inpatient healthcare (e.g. admissions into general or psychiatric hospital) made up the largest proportion of costs (33.1%), followed by outpatient mental healthcare (26%). Taking mental health services alone, the proportion of patients using outpatient services was 45.2%, with only 2.3% receiving inpatient care. Costs from lost productivity were also substantial, with 47.6 days per patient per year lost because of absence from or inefficiency at work. The authors note that the total

economic burden of personality disorders "seems considerably higher than the burden of patients seeking mental health treatment for other mental disorders, such as depression and generalized anxiety disorder, and comparable to that in schizophrenia".

Another area that is relatively under-explored is the impact of comorbid personality disorder on service use in people with other severe mental disorders. This is an important population to study because people with severe mental illness (SMI) are among the heaviest consumers of mental health services. From a service perspective, studies of cohorts of patients with SMI have found that those with co-morbid personality disorder spend more time in hospital [61, 62], and that personality disorder is associated with greater unmet need among psychiatric inpatients [108]. Co-occurring personality pathology may also contribute to elevated mental health service use, including use of psychotropic drugs, among young adults in the community [109], and it may affect different types of service use (i.e. inpatient, outpatient, and emergency) differentially [110]. However, the full impact of co-morbid personality disorder on community and hospital-based service utilization by patients with SMI has not been described. Moreover, the factors underlying an association between co-morbid personality disorder and increased service use in patients with SMI are not well understood.

1.6 Summary and remaining areas of uncertainty in the background literature

Personality disorder is prevalent in the general population (around 5% of British population) and highly prevalent in clinical populations. The use of standardized, semi-structured instruments is usually necessary to diagnose personality disorder, although brief screening tools are proving to be a quick, easy and effective way of identifying individuals at risk of the diagnosis.

In the community, individuals with personality disorder generally experience more social problems, and function at a lower level, compared to those without personality disorder. Longitudinal studies show that whilst symptomatic remission is common in personality disorder, sustained improvement in social functioning is hard to attain, especially in those with borderline personality disorder.

The reviewed literature indicates that personality disorder is strongly associated with increased psychiatric morbidity, increased mortality and greater health service use. However, the background literature is weak in the following areas:

1. The association between personality disorder and general physical health has been little researched. Most studies on this subject are limited by their reliance on clinical, help-seeking, or age-specific samples; their focus on subtypes of personality disorder, or their focus on discrete medical conditions as outcomes. Relatively little is known about the relationship between personality disorder and general health in community populations.

2. Previous mortality and life expectancy studies involving people with personality disorder have limited generalizability to present day clinical populations,

due to their use of out-dated personality disorder classifications, exclusive use of inpatient samples, or substantial loss to follow-up. No previous research has investigated specific clinical predictors of early natural and unnatural mortality in individuals with personality disorder.

3. Although the literature indicates that the burden of personality disorder on clinical services is as high as that of Axis I disorders, it remains unclear whether the association between personality disorder and service utilization is predominately confounded or mediated by co-morbid Axis I disorders. Co-morbid personality disorder in severe mental illness (SMI) has been linked to increased psychiatric bed use, [61, 62], but the full impact of co-morbid personality disorder on community and hospital-based service utilization by patients with SMI has not been described. Moreover, the factors underlying an association between co-morbid personality disorder and increased service use in patients with SMI are not well understood.

1.7 Aims and objectives

1.7.1 Overall aim

The overall aim of the work described in this thesis was to improve the knowledge about the public health burden of personality disorders in South East London, specifically as this relates to the general health and mortality of individuals with personality disorders. An additional aim was to enhance knowledge about the psychiatric service use of people with personality disorders in South East London.

1.7.2 Specific objectives

The above aims were addressed by focusing on four specific objectives:

1. To establish the life expectancy and all-cause mortality among secondary mental healthcare patients with personality disorder
2. To establish the clinical predictors of all-cause and cause-specific mortality among secondary mental healthcare patients with personality disorder
3. To establish the impact of co-morbid personality disorder on the service use of people with severe mental illness within secondary mental healthcare.
4. To examine the association between personality disorder status and general health in a local representative community sample

Each objective forms the basis of a discrete study; the four studies are presented in the form of published manuscripts in subsequent chapters.

1.7.3 Delivering the objectives

1.7.3.1 Establishing the life expectancy and all-cause mortality among secondary mental healthcare patients with personality disorder

The objective of this study was to examine the life expectancy and relative mortality in people with personality disorder within secondary mental healthcare. This was achieved using a large psychiatric case register in southeast London, UK. Mortality data were obtained through national mortality tracing procedures. Standardised mortality ratios (SMRs) and life expectancies at birth were calculated, using general population mortality statistics as the comparator. This work is presented in the form of a published manuscript in Chapter 2.

1.7.3.2 Establishing the clinical predictors of all-cause and cause-specific mortality among secondary mental healthcare patients with personality disorder

The objective of this study was to delineate these risk factors, using a large cohort of patients identified with personality disorder in the electronic case records of a large secondary mental healthcare provider, linked to national mortality tracing. The effect of a number of pre-specified clinical variables on all-cause, natural cause and unnatural cause mortality was modeled using Cox regression. This work is presented in the form of a published manuscript in Chapter 3.

1.7.3.3 Establishing the impact of co-morbid personality disorder on the service use of people with severe mental illness within secondary mental healthcare

This research objective was to examine the impact of co-morbid personality disorder, on inpatient and community-based service use and risk of involuntary hospitalization, amongst patients with severe mental illness. A study was undertaken using a cohort composed of individuals from three mutually exclusive diagnostic groups – (1) severe mental illness (SMI); (2) personality disorder; and (3) SMI with comorbid personality disorder – identified in the case records of a large secondary mental healthcare provider. Multivariable logistic regression was used to model the association of diagnosis category on service use outcomes, adjusting for a range of possible explanatory variables. This work is presented in the form of a published manuscript in Chapter 4.

1.7.3.4 Examining the association between personality disorder and general health in the community

This research objective was to examine the association between personality disorder and general health, using a cross-sectional psychiatric and physical morbidity survey of a representative community sample in South East London, UK. Multivariable logistic regression was used to model the association between personality disorder screen status (as per the Standardized Assessment of Personality-Abbreviate Scale (SAPAS)) and general self-reported health, adjusting for a wide range of potential explanatory variables. This work is presented in the form of a published manuscript in Chapter 5.

1.8 Sources of data

The studies in this thesis draw their data from two sources. The clinical cohort studies all made use of an electronic case register, the Clinical Record Interactive Search (CRIS) system, of the South London and Maudsley NHS Foundation Trust. The community study, of personality disorder and general health, was a secondary analysis using data from the South East London Community Health (SELCOH) study.

1.8.1 Clinical Record Interactive Search (CRIS) system

The South London and Maudsley NHS Foundation Trust (SLAM) is a secondary mental healthcare provider that serves an aggregate population of 1.2 million people living in four London boroughs (Lambeth, Southwark, Lewisham and Croydon).

The electronic clinical records system of SLAM, named Patient Journey System (PJS), is an integrated electronic clinical record used across all Trust services. It is a comprehensive record of all clinical information recorded throughout patients' journeys through Trust services, and includes demographic and contact information, details of referrals and transfers between services, including all community-based and inpatient services. The record is used and maintained by multi-disciplinary professionals (doctors, nurses, therapists, psychologists, etc) and consists of both structured data (such as dates, gender, integers and pick-list data in structured forms) and unstructured free text (including written assessments, progress notes and correspondence). PJS has been used comprehensively across all SLAM services since 2006.

The Clinical Record Interactive Search (CRIS) system was developed in 2008, to allow searching and retrieval of anonymised (or de-identified) information from PJS, i.e. the full electronic clinical records of SLAM. As of 2014, approximately 230,000 cases are represented on the system. CRIS was approved as a data resource for secondary analysis by the Oxfordshire Research Ethics Committee (reference 08/H0606/71+5). As CRIS is an anonymised database there was no requirement for individual participant consent for studies using CRIS, including the studies reported in this thesis.

The CRIS system allows researchers to search both structured and free-text fields in the clinical records, and searches can be tailored precisely to the research question. Natural language programming (NLP) applications have been designed to identify specific terminology of interest, making it possible to extract increasing volumes of supplementary information from free-text content in the clinical records. NLP applications go beyond a basic keyword search to take into account the context of terms of interest (such as negation and tense) making it possible to conduct large scale automated extraction and coding of free-text information, with a high degree of precision compared to human coders.

1.8.2 South East London Community Health Study (SELCOH)

The South East London Community Health (SELCOH) study is a community psychiatric and physical morbidity survey of adults in the general population. The original aim of the study was to generate epidemiological evidence of the mental and physical health needs in the local population of South East London -- an ethnically

and socioeconomically diverse, geographically defined, inner city community. The study was developed by and in partnership with the clinicians serving the local population.

Wave 1 of the survey was carried out in 2008-2010. Trained interviewers conducted face-to-face computer assisted interviews with 1698 adults aged 16 years and over, from 1076 randomly selected private households located within Southwark and Lambeth, two South East London boroughs.

The interview survey questionnaire collected information on a number of topics, including: socio-demographics; socioeconomic status; migration; social support; neighbourhood characteristics; social adversity; health behaviours; physical and mental health symptoms; and treatment and health service use. Translators were used in interviews with non-English speaking adults. Participants received £15 for a completed interview. The study received approval from the King's College London Research Ethics Committee, with reference CREC/07/08-152.

1.9 My contribution

I was first author on all four of the published papers in this thesis, and was jointly responsible (along with my supervisors) for the conceptualisation and design of the studies. I was responsible for all data extraction and cleaning, with help from informaticians in my department. I conducted all the data analyses, with support from my supervisors. I undertook report writing in collaboration with my supervisors and other co-authors.

1.9.1 Studies using CRIS

In order to extract the data needed for my studies, I collaborated with clinical informaticians of the CRIS team, by providing the detailed instructions on the data to be extracted. The informaticians extracted the data according to those instructions. I was responsible for checking the quality of the data and data cleaning, and also received help from the informaticians in the process.

1.9.1.1 Validation of personality disorder diagnoses

I undertook a formal validation of the NLP application developed for identifying diagnoses on CRIS, specifically of personality disorder diagnoses in my cohort of interest. Fifty cases with or without a personality disorder diagnosis were randomly selected from a cohort of patients with severe mental illness and/or personality disorder. Case note documents for the 50 individuals were then independently processed to mask all diagnosis information. As a trained psychiatrist, I subsequently rated these 50 cases for the presence or absence of personality disorder, whilst blind to the original diagnostic information. The kappa coefficient for level of

agreement between the case register diagnosis and blind clinical rating of the case records was 0.72 ($p<0.001$).

1.9.2 Study using SELCOH

For the study using SELCOH, I had access to the full set of data collected from Wave 1 of SELCOH, and used this dataset selectively for the purpose of my study, i.e investigating the association between personality disorder and general health. I was responsible for all data analyses, with advice on analytic strategy from my supervisors and other co-authors.

Chapter 2 Life expectancy at birth and all-cause mortality among people with personality disorder

This chapter is presented as a published paper and is an exact copy of the following journal publication:

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Life expectancy at birth and all-cause mortality among people with personality disorder

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ABSTRACT

Objective: It is well established that serious mental illness is associated with raised mortality, yet few studies have looked at the life expectancy of people with personality disorder (PD). This study aims to examine the life expectancy and relative mortality in people with PD within secondary mental health care.
Methods: We set out to examine this using a large psychiatric case register in southeast London, UK. Mortality was obtained through national mortality tracing procedures. In a cohort of patients with a primary diagnosis of PD ($n = 1836$), standardised mortality ratios (SMRs) and life expectancies at birth were calculated, using general population mortality statistics as the comparator.
Results: Life expectancy at birth was 63.3 years for women and 59.1 years for men with PD—18.7 years and 17.7 years shorter than females and males respectively in the general population in England and Wales. The SMR was 4.2 (95% CI: 3.03–5.64) overall; 5.0 (95% CI: 3.15–7.45) for females and 3.5 (95% CI: 2.17–5.47) for males. The highest SMRs were found in the younger age groups for both genders.
Conclusion: People with PD using mental health services have a substantially reduced life expectancy, highlighting the significant public health burden of the disorder.
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Introduction

Mental disorder is an established risk factor for increased mortality [1,2]. People with mental disorders die prematurely for a variety of reasons, including poor physical health [3–5], adverse physiological consequences of long term psychotropic medication, unhealthy lifestyle [5], as well as increased death rates as a result of suicide, accidents and homicide [6–8]. The risk of increased mortality has been shown to vary according to type of mental disorder, with substance use disorders conferring a particularly high risk of early death [1,9,10]. Personality disorder is a global health problem [11]. It is one of the hardest psychiatric conditions to treat and has a considerable economic impact on general medical and mental health services. People with personality disorder (PD) are known to be at particularly high risk of increased mortality as a result of both natural and unnatural causes [12–16]. However, no study has comprehensively examined life expectancy at birth of the full range of secondary care service users with PD. Life expectancy is a vital public health statistic which serves as a readily identifiable indicator of general mortality in a specified population followed up for a certain period of time.

Methods

In the current study, we used a large psychiatric case register to conduct a retrospective cohort study, the purpose of which was to ascertain life expectancy at birth and age- and gender-standardised mortality of personality-disordered patients compared to the general England and Wales population. We also calculated standardised mortality ratios stratified by gender and age group, in order to investigate differences among subgroups.

Setting and participants

Our sample was drawn from the electronic case register of the South London and Maudsley NHS Foundation Trust (SLAM), Europe's largest secondary mental health care provider serving an aggregate population of 1.2 million people living in four London boroughs (Lambeth, Southwark, Lewisham and Croydon). The SLAM Biomedical Research Centre (BRC) Case Register provides anonymised in-depth information derived from an electronic clinical record system. The development and protocol of this case register has been described in detail in a previous open access publication [17]. SLAM incorporates inpatient and outpatient care, and a broad array of community care teams, as well as psychiatric liaison services to general hospitals, and forensic, old age, child and adolescent, and learning disability mental health teams.

Electronic clinical records have been used comprehensively across all SLAM services since 2006 and the BRC Case Register Interactive Search (CRIS) system was developed in 2008 to allow searching and retrieval

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of anonymised information from full clinical records with over 182,000 cases currently represented on the system. CRIS was approved as a data resource for secondary analysis by the Oxfordshire Research Ethics Committee (reference 08/H0606/71).

All cases within the case register that had been given a primary PD diagnosis by International Classification of Diseases, 10th Edition (ICD-10) within the four-year period from 1 January 2007 to 31 December 2010, and were over 15 years of age, were recruited into the study as a cohort ($n = 1836$). All-cause mortality in patients with PD over this four-year period was used for analyses. The beginning of 2007 was chosen as a starting point for the observation because this corresponded to the most complete recording of clinical data on the Case Register.

Measures

Death identification

NHS number is a\ unique identifier for UK NHS records. All death certifications are linked to this identifier at national level, and health service providers are required by law to keep records up to date with respect to this. Every death in the UK, after the issuing of a formal death certificate, must be reported to the Office for National Statistics General Records Office and conveyed to the NHS Care Records Service, which holds these death notifications and makes them available to all NHS organisations. In accordance, on a weekly basis, SLAM downloads a list of deceased patients from the NHS Care Records Service and updates their dates of death onto the patients' records, whether that person is active to services or has been discharged. In the present study, deaths determined by a date of death within the 4-year period were enrolled for analyses.

Personality disorder

This was based on the patient's primary ICD-10 diagnosis of PD (categories F60 and F61) dated from 1 January 2007 to 31 December 2010 in the Case Register.

Demographics

Date of birth, gender, ethnicity and marital status of all patients are routinely recorded on the Case Register. Age was calculated at the date of primary diagnosis of PD that occurred in the observation period. All those who were under the age of 15 at this date were excluded from the analyses.

Statistical analysis

Life expectancy at birth

Life expectancy at birth is an index derived from age-specific mortality that highlights the impact of mortality in younger age groups. A life table is constructed using the age-specific mortality of an observed population over a given period of time; life expectancy at birth is calculated from the accumulated total person-years contributed by the entire concurrent cohort divided by the size of the population at the beginning of follow up. We used Chiang's method of abridged life tables with five-year age bands to calculate life expectancy [18]. For each individual, the period of time from the date of PD diagnosis until death or the end of the observation period (whichever occurred first), was taken as the 'at-risk period'. In each 5-year age band, the total person-years at risk is the sum of all the at-risk periods of the individuals in the age band. The number of people who had a recorded death during this period was used as the numerator to calculate the annual mortality rate for the age band. In some instances, individuals moved from one age band to the next during the four-year observation period. In such cases, the specific time at risk contributed by those individuals to each age band was then assigned to the respective age bands. Given that those below the age of 15 years were excluded from our cohort, we filled in the three cells in the life table corresponding to death rates for 0–5 years, 5–10 years and 10–15 years of age with the respective comparative death rates for these age groups in the England and Wales general population in 2008 [19]. These tables were inserted into a Microsoft Excel spreadsheet and values for gender-specific life expectancy were calculated with 95% confidence intervals. These life expectancy estimates were compared with gender-specific life expectancy at birth for the England and Wales population in 2006–2008 [20], and the arithmetic differences between the two were then calculated.

Standardised mortality ratios

The estimation of all SMRs was carried out using Stata version 10 [21]. As with life expectancy, the at-risk period was defined as the period of time from the date of PD diagnosis in the observation period until date of death or the end of the observation period (whichever occurred first). SMRs were calculated for the four-year follow-up period, using the number of deaths observed in the cohort in these four years as the numerator. SMRs were gender- and age-standardised using five-year age bands (i.e., 15–19, 20–24, 25–29, …, 85–89, 90 or over). The denominator was derived by calculating the total person-years at risk in each age group of the sample, then multiplying this by the corresponding age- and gender-specific mortality rate in the England and Wales population [19]. The time period at risk contributed by individuals who moved from one age band to the next during the observation period was assigned to the respective age bands.

Results

A total of 1836 cases formed the analysed cohort. The characteristics of the cases are displayed in Table 1. In summary, the majority were female (60%), 73% were white British and 74% were in the 15–44 years age group. Regarding marital status, 66% were single, 10% were either married, cohabiting or in a civil partnership, and 12% were divorced, separated or widowed.

Estimates of life expectancy at birth of people with PD, stratified by gender, are displayed in Table 2 along with the differences compared to general population estimates. Compared to the England and Wales general population, the life expectancy of men and women with PD in this sample was lower by 17.7 and 18.7 years respectively.

Table 3 displays age- and gender-standardised SMRs for the entire cohort and then stratified by gender and age groups. The SMR for all patients with PD in this cohort was 4.2 (95% CI: 3.03–5.64) and the SMRs for male and female personality-disordered patients were of a similar magnitude. Stratification by age bands revealed that the youngest age group (15–44 years old) carried the highest excess mortality, compared to the general population, and that the youngest age group had higher excess mortality compared to the oldest age group.

Table 1
Characteristics and 4-year mortality of patients with personality disorder

Characteristics	Number of PD cases (number of deaths, %)
Total cohort	1836 (43, 2.34%)
Gender	
Female	1103 (23)
Male	733 (20)
Ethnicity	
White British	1340 (39)
Mixed	29 (0)
Asian or Asian British	41 (3)
Black or Black British	226 (1)
Other	84 (0)
Not stated/unknown	116 (0)
Age group	
15–44 years	1354 (20)
45–64 years	419 (11)
65+ years	63 (12)
Personality disorder	
Any personality disorder (F60–F61)	1836 (43)
Cluster A (F60.0, F60.1)	109 (2)
Cluster B (F60.2, F60.3, F60.31, F60.4)	924 (18)
Cluster C (F60.5, F60.6, F60.7)	62 (1)
Other	741 (22)

Table 2
Estimated life expectancy at birth of patients with personality disorder in southeast London

	Female		Male	
	Life expectancy (95% CI, number of deaths)	Difference from female general population*	Life expectancy (95% CI, number of deaths)	Difference from male general population*
All personality disorders	62.9 (61.5–64.3, $n=23$)	−18.7 years	59.7 (57.9–61.5, $n=20$)	−17.7 years

*Life expectancy at birth 2006–2008 in England and Wales: Female = 81.6 years; Male = 77.4 years [21].

Discussion

Main findings

Our study highlights the substantial public health burden of personality disorder in terms of elevated mortality, especially for younger age groups. We found that patients with personality disorder can expect, on average, considerably shortened lives compared to their counterparts in the general population, with men losing 17.7 years of life and women losing 18.7 years. Their mortality was four times that of the comparative general population. Furthermore, a 10-fold increased mortality risk was found for younger people with personality disorder. These findings critically underscore the vulnerable nature of people with PD and the urgent need for developing feasible strategies to prevent premature mortality in this group of patients.

A number of studies have previously found an association between PD and raised mortality [12–16]. However, to our knowledge, our study is the first to comprehensively examine the life expectancy of secondary care service users with PD. Only one other study has attempted to describe life expectancy for people with PD. Hannerz et al. [22] used a Swedish nationwide hospital discharge registry to estimate life expectancies in different diagnostic groups for individuals treated as inpatients. Both men and women with personality disorder had a lower "expectation of remaining life" at all ages, compared to people with schizophrenia and affective psychosis as well as the general population. However, the restriction of that analysis to hospitalised patients and the use of ICD-8 diagnoses limit the application of the findings to present-day secondary care settings. Approximate estimates of life expectancy at birth can be calculated using SMRs from published studies [23]; however doing this from the few existing studies would only generate a very rough estimate for people with PD, and one which would be less accurate than the method used in our study.

Strengths and limitations

Our study has a number of strengths. We analysed a large sample of cases covering a broad age range. We included everyone with PD who had contact with services over a 4-year period, whether this was in the context of inpatient admission, community care or one-off emergency presentation. We therefore captured a wide range of patients with PD adding to the generalisability of our findings to other secondary care settings. The NHS setting with relatively comprehensive coverage provided to specific geographic catchments was also an advantageous setting regarding generalisability to other secondary care settings. In terms of diagnosis, although research diagnostic criteria may be preferable, our use of clinicians' case record ICD-10 diagnoses favours generalisability to real clinical practice. The mortality data were derived from a robust source and under-ascertainment of deaths is likely to have been very low. Furthermore, any possible failures in the reporting of deaths would only have led to an underestimation of the detected associations.

The findings need to be considered in the light of certain limitations. First, standardised mortality ratios only provide a coarse picture of deaths in a specified study population without the consideration of confounders other than age and gender. Potentially important confounders which are unmeasured in this study include socio-economic status, comorbid psychiatric and physical conditions and substance misuse. Second, we were only able to report on all-cause mortality; against this, our aim was to clarify excess mortality and reduced life expectancy rather than investigate underlying causes of death. Third, our statistical power to examine associations between PD clusters and mortality was not sufficient to detect significant differences. Fourth, we used national data as a comparison, which might not be representative of the local population in southeast London. To address this, we carried out a sensitivity analysis, standardising with mortality statistics for London alone (data not shown); in the sensitivity analysis, the point estimates for SMRs were not substantially different compared to those displayed in Table 3. Fifth, the observed age-related decline in SMRs may be due to survival effects i.e., that people with PDs surviving to older age may have other protective factors conferring this survival. Finally, we acknowledge that a large number of people with PD do not present themselves to mental health services and are either managed in primary care or within general medical services. Our findings therefore only apply to secondary mental health service users.

Table 3
Age- and gender-standardised mortality ratios (SMRs) for personality disorder, stratified by gender and age groups in 2007–2010

		Number of cases	Standardised mortality ratio (95% CI, number of deaths)
Total PD group		1836	4.2 (3.03–5.64, $n=43$)
Females		1103	5.0 (3.15–7.45, $n=23$)
Males		733	3.5 (2.17–5.47, $n=20$)
Age	15–44 years	1354	10.3 (6.29–15.91, $n=20$)
	45–64 years	419	3.6 (1.78–6.37, $n=11$)
	65 and over	63	2.5 (1.31–4.43, $n=12$)

Possible mechanisms

A number of mechanisms are likely to underlie the detected association between PD and reduced life expectancy. First, the rate of death from unnatural causes, including suicide and homicide, is elevated in PD [6] and this is likely to have contributed to the reduced life expectancy detected in this study. Second, considering deaths due to natural causes, personality disorder is associated with poorer general health. For example, Borderline PD has been found to be associated with higher numbers of medical problems and one recent epidemiological study found that most PD groups were associated with cardiovascular disease [24]. More generally, mental disorders are linked to poor health through unhealthy lifestyle [25,26], physical consequences of psychotropic medication [3], and problems accessing medical care [27]; some or all of these factors may account for reduced survival in people with PD. Substance use disorders are a major cause of death and disability [1,9] and frequently co-occur with PD, particularly in young people with Cluster B PD [28], and elevated mortality in this particular group may reflect unhealthy lifestyles characterised by heavy substance use and smoking. Patients with PD are often prescribed excessive doses of psychotropic and non-psychotropic medications [29] which themselves may potentially lead to unwanted physical consequences. Finally, people with PD often struggle to obtain adequate health care and have greater unmet treatment needs [30].

We conclude that people with PD have a significantly reduced life expectancy at birth compared to the general population. This fact alone highlights the importance of routinely assessing personality

status in psychiatric patients. It also highlights the need for clinicians to pay greater attention to the physical health status and lifestyles of patients with PD, in addition to the standard practice of assessing their suicide risk. Further research is urgently required to determine the mechanisms underlying the reduced life expectancy of people with PD.

Conflict of interest statement

We hereby declare that no competing interests exist in this work.

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Chapter 3 Predictors of natural and unnatural mortality among patients with personality disorder: evidence from a large UK case register

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PLOS ONE

Predictors of Natural and Unnatural Mortality among Patients with Personality Disorder: Evidence from a Large UK Case Register

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Abstract

Background: People with personality disorder have reduced life expectancy, yet, within this population, little is known about the clinical predictors of natural and unnatural deaths. We set out to investigate this, using a large cohort of secondary mental health patients with personality disorder.

Methods: We identified patients with an ICD-10 diagnosis of personality disorder, aged ≥15 years in a large secondary mental healthcare case register. The case register was linked to national mortality tracing. Using Cox regression, we modelled the effect of a number of pre-specified clinical variables on all-cause, natural cause and unnatural cause mortality.

Findings: 2,440 patients were identified. Eighty-five deaths (3.5% of cohort) occurred over a 5-year observation period, of which over 50% were from natural causes. All-cause mortality was associated with alcohol or drug use (adjusted Hazard Ratio [aHR] 2.3; 95% CI 1.3–4.1), physical illness (aHR 1.9; 95% CI 1.0–3.6), and functional impairment (aHR 1.9; 95% CI 1.0–3.6). Natural cause mortality was associated with mild problems of alcohol or drug use (aHR 3.4; 95% CI 1.5–7.4), and physical illness (aHR 2.4; 95% CI 1.0–5.6). Unnatural cause mortality was associated only with severe alcohol or drug use (aHR 3.1; 95% CI 1.3–7.3).

Interpretation: Alcohol and drug use, physical illness, and functional impairment are predictors of mortality in individuals with personality disorder. Clinicians should be aware of the existence of problems in these domains, even at mild levels, when assessing the needs of patients with personality disorder.

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Data Availability: The authors confirm that, for approved reasons, some access restrictions apply to the data underlying the findings. The dataset is comprised of original patient-level data and it cannot be deposited in a publicly accessible format. The data is available on request and requests may be sent to the Clinical Records Interactive Search (CRIS) system administrator (contact details below), to request the data for this study. CRIS Administrator, PO 92, Institute of Psychiatry, De Crespigny Park, London SE5 8AF or email: cris.administrator@kcl.ac.uk.

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Competing Interests: One of the co-authors, RS, is an academic editor for PLOS ONE. This does not alter the authors' adherence to PLOS ONE policies on sharing data and materials.

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¶ RDH and PM are joint senior authors on this work.

Introduction

Personality disorders (PD) present a considerable health problem globally. They are highly prevalent mental disorders, affecting up to 10% of community samples [1]. People with PD are at increased risk of co-morbid health problems, substance misuse [2] and cardiovascular disease [3]. It is now well established that serious mental disorder is associated with early mortality [4]. However, only very recently has it emerged that individuals with a PD diagnosis also have substantially reduced life expectancy [5,6], with increased mortality from both natural and unnatural causes [6,7,8]. The excess mortality risks are particularly high for younger people with personality disorder [5]. Yet, within the population of individuals with PD, little is known about the clinical predictors of natural and unnatural mortality. Premature death in people with PD may arise as a result of a number of mechanisms. For example, people with PD often have difficulty with emotional regulation, which they may try to manage with behaviours carrying significant health risks, such as self-harm, and alcohol and substance abuse. These same behaviours also carry a risk of accidental death. Comorbid axis-I psychopathology [9,10], tendency to hostility and aggression [11], and poor psychosocial functioning are common

features among individuals with PD and may partially account for the excess mortality, along with recognised associations between PD and poor health [3,12]. However, these are speculative mechanisms with little empirical data to support or refute them.

No previous study has examined the independence of clinical risk factors for mortality among patients with PD. This is an important gap in the literature, as effective interventions to reduce mortality must be based on a thorough knowledge of the specific risk factors predicting mortality in the population in question. With this in mind, we set out to investigate the independence of a set of *a priori* clinical predictors for all-cause, natural and unnatural mortality, among individuals with PD known to secondary mental health services.

Method

Setting

Our sample was drawn from the electronic clinical records of the South London and Maudsley NHS Foundation Trust (SLAM). SLAM is a secondary mental health care provider that serves an aggregate population of 1.2 million people living in four London boroughs (Lambeth, Southwark, Lewisham and Croydon). Electronic clinical records have been used comprehensively across all SLAM services since 2006 and the SLAM Biomedical Research Centre (BRC) Clinical Record Interactive Search (CRIS) system was developed in 2008 to allow searching and retrieval of anonymised information from full clinical records with approximately 230,000 cases currently represented on the system. The development and protocol of CRIS has been described in detail [13], as has the process for case note anonymisation [14]. CRIS was approved as a data resource for secondary analysis by the Oxfordshire Research Ethics Committee (reference 08/H0606/71+5). As CRIS is an anonymised and de-identified database there is no requirement for individual participant consent for this study.

Inclusion Criteria

The analysed cohort was extracted from the CRIS system and comprised all individuals meeting all of the following criteria:

- Age greater than 15 years;
- Primary International Classification of Diseases, 10th Edition (ICD-10) [15] diagnosis of PD (categories F60 and F61) on case record within the period from 1 January 2007 to 31 December 2011;
- Assessed by a clinician using the Health of the Nations Outcome Scale (HoNOS) at least once during this same period.

The face validity of PD diagnoses on the CRIS system has been examined against blinded clinician rating of case note document, with a kappa coefficient of 0.72 ($p<0.001$) for level of agreement [16].

Main outcome measures

We defined three five-year outcomes: all-cause mortality, natural and unnatural mortality. The beginning of 2007 was chosen as a starting point for the observation because this corresponded to the most complete recording of clinical data on the CRIS system.

Death identification. All death certifications are linked to NHS numbers. Every death in the UK, after the issuing of a formal death certificate, must be reported to the Office for National Statistics General Records Office and conveyed to the NHS Care Records Service, which holds these death notifications and makes them available to all NHS organisations. Accordingly, on a weekly basis, SLAM downloads a list of deceased patients from the NHS Care Records Service and updates their dates of death onto the patients' records, whether that person is active to services or has been discharged. In the present study, deaths determined by a date of death within the 5-year period were enrolled for analyses.

Cause of Death. Death certification data on all deaths in CRIS cases up to the end of 2011 was obtained from the Health & Social Care Information Centre (HSCIC). Cause of death data, in the form of ICD-10 codes, were matched to deceased cases in the study cohort using individual NHS number. Natural causes of death were defined as those with ICD-10 codes A00-R99 (major diagnostic categories), while unnatural causes were identified by ICD-10 codes V01-Y89, U509 (accidental, intentional, and undetermined).

In the case of a deceased individual not having corresponding cause of death data identified by this method, anonymised records were extracted using CRIS and manually scrutinised by a clinician (MF) for information pertaining to natural/unnatural cause of death.

Explanatory variables

Demographic and socioeconomic factors. Date of birth, gender, and ethnicity were defined from routinely completed fields on the source records. Age was calculated from the patient's PD diagnosis date. Ethnicity classifications were: "White British or other white background", "East Asian", "South Asian", "African, Caribbean or other black background", and "Mixed, unknown, and others".

The index of multiple deprivation is an area-level measure of socioeconomic status, calculated at the level of lower super output area for the residence (LSOA) – a UK address-grouping construct which contains a minimum of 1000 residents and 400 households, and an average of 1,500 residents. The index of multiple deprivation is derived from multiple domains including: employment, income, education, health, barriers to housing and services, crime and the living environment. Each domain is given a specific weighting to reflect its overall importance in the calculation of this index. Moreover, each domain is made up of a number of specific indicators that reflect different aspects of the deprivation they are intended to measure. Full details of each domain, the indicators they contain and the domain weightings that were used to derive the index of multiple deprivation are reported elsewhere [17]. In this study, a patient's residential postcode in England that was recorded closest in time to the beginning of the observation period was used to obtain an index of multiple deprivation score, which was used in the analysis as a proxy for socioeconomic status. Increasing scores in the index of multiple deprivation are indicative of more severe deprivation. In the analysis, deprivation scores were divided into tertiles. A separate category was given for homelessness.

Clinical variables. We rated the presence and severity of key clinical problems using the Health of the Nation Outcome Scale (HoNOS), a widely used and validated, 12-item, clinician-administered measure [18,19,20]; a review of the psychometric properties of the HoNOS by Pirkis et al found that the instrument had good validity and adequate reliability overall [19]. We selected the following 8 HoNOS items for investigation as potential risk factors for mortality, on *a priori* grounds: (1) overactive or aggression; (2) non-accidental self-injury; (3) problem-drinking or drug-taking; (5) physical illness or disability problems; (6) problems associated with hallucinations and delusions; (7) problems with depressed mood; (9) problems with social relationships; and (10)

Table 1. Cohort characteristics and crude hazard ratios for association with all-cause mortality.

Variables	Number of individuals (Number of deaths)	% deaths	Crude Hazard Ratio (95% CI)
Total	2440 (85)		
Gender			
Female	1372 (42)	3.1	Referent
Male	1068 (43)	4.0	1.3 (0.8–1.9)
Age group			
15–29 years	763 (13)	1.7	Referent
30–44	976 (22)	2.3	1.1 (0.6–2.3)
45–64	610 (34)	5.6	3.0 (1.6–5.7)**
65+	91 (16)	17.6	12.0 (5.8–24.9)***
Ethnicity			
White British or other white	1764 (73)	4.1	Referent
East Asian	38 (3)	7.9	2.0 (0.6–6.5)
South Asian	35 (0)	0.0	–
African, Caribbean or other black	388 (7)	1.8	0.4 (0.2–0.9)*
Mixed/unknown	215 (2)	0.9	0.3 (0.1–1.1)
Deprivation in area of residence			
Low	741 (22)	3.0	Referent
Medium	749 (28)	3.7	1.3 (0.7–2.2)
High	749 (30)	4.0	1.4 (0.8–2.4)
Homeless/Missing/unknown	201 (5)	2.5	0.8 (0.3–2.0)
Non-accidental self injury			
Not a problem	1404 (51)	3.6	Referent
Subclinical, minor problem	389 (9)	2.3	0.7 (0.3–1.3)
Mild problem	311 (11)	3.5	1.1 (0.6–2.0)
Severe/very severe problem	325 (14)	4.3	1.4 (0.7–2.4)
Missing	11 (0)	0.0	
Overactivity and aggression			
Not a problem	1123 (30)	2.7	Referent
Subclinical, minor problem	659 (30)	4.6	1.7 (1.0–2.9)*
Mild problem	379 (15)	4.0	1.6 (0.8–2.9)
Severe/very severe problem	270 (10)	3.7	1.5 (0.7–3.0)
Missing	9(0)	0.0	
Depressed mood			
Not a problem	522 (18)	3.5	Referent
Subclinical, minor problem	638 (24)	3.8	1.1 (0.6–2.0)
Mild problem	785 (26)	3.3	1.0 (0.5–1.8)
Severe/very severe problem	484 (17)	3.5	1.1 (0.6–2.1)
Missing	11 (0)	0.0	
Hallucinations and delusions			
Not a problem	1674 (56)	3.4	Referent
Subclinical, minor problem	310 (7)	2.3	0.6 (0.3–1.4)
Mild problem	250 (10)	4.0	1.2 (0.6–2.3)
Severe/very severe problem	193 (12)	6.2	1.7 (0.9–3.2)
Missing	13 (0)	0.0	
Drinking or drug use			
Not a problem	1447 (44)	3.0	Referent
Subclinical, minor problem	305 (5)	1.6	0.6 (0.2–1.4)
Mild problem	298 (15)	5.0	1.7 (0.9–3.0)
Severe/very severe problem	363 (21)	5.8	1.9 (1.1–3.2)*
Missing	27 (0)	0.0	

Table 1. Cont.

Variables	Number of individuals (Number of deaths)	% deaths	Crude Hazard Ratio (95% CI)
Physical illness or disability			
Not a problem	1484 (29)	2.0	Referent
Subclinical, minor problem	363 (14)	3.9	2.0 (1.0–3.7)*
Mild problem	322 (15)	4.7	2.2 (1.2–4.1)*
Severe/very severe problem	253 (27)	10.7	5.5 (3.3–9.4)**
Missing	18 (0)	0.0	
Relationships			
Not a problem	563 (19)	3.4	Referent
Subclinical, minor problem	531 (18)	3.4	1.0 (0.5–1.9)
Mild problem	731 (21)	2.9	0.9 (0.5–1.6)
Severe/very severe problem	594 (26)	4.4	1.4 (0.8–2.6)
Missing	21 (1)	4.8	
Activities of daily living			
Not a problem	1179 (29)	2.5	Referent
Subclinical, minor problem	584 (16)	2.7	1.0 (0.6–1.9)
Mild problem	453 (20)	4.4	1.7 (1.0–3.0)
Severe/very severe problem	200 (20)	10.0	4.2 (2.4–7.4)***
Missing	24 (0)	0.0	

*p<0.05;
**p<0.01;
***p<0.001.
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problems with activities of daily living (ADL) – the latter refers to problems with basic activities of self-care (e.g. eating, washing, dressing, toilet) as well as more complex skills such as budgeting, shopping, and use of transport. The eight exposures were chosen in order to represent a range of non-demographic variables (behavioural, co-morbid symptoms, health status and functioning status) that have been associated with adverse outcomes including mortality in previous studies investigating personality disorder or other mental disorders [21,22,23,24,25].

The HoNOS items have operationalized response options that follow the format of: 0 "not a problem"; 1 "subclinical, minor problem requiring no action", 2 "mild problem but definitely present", 3 " moderately severe problem", and 4 "severe to very severe problem" [26]. In this analysis, we used items from the first HoNOS questionnaire that was completed during the observation period as measures of baseline level of clinical severity in each patient. Due to small numbers in some categories, for the purposes of data analysis, all items were collapsed into four categories: 0) not a problem; 1) subclinical problem; 2) mild problem, and 3–4) severe or very severe problem.

Statistical analysis

We used Cox proportional hazards regression to model the effect of the above risk factors on 1) all-cause mortality, 2) natural cause mortality and 3) unnatural cause mortality, respectively. For each patient the 'at-risk' period commenced from the date of the PD diagnosis. The censoring date was the end of the observation period (31st December 2011) for those who survived until the end of the observation period, and the event date was the date of death if this occurred during the observation period. Crude and adjusted associations between all-cause, natural cause and unnatural cause mortality and the principal exposures of interest (HoNOS subscale scores) or potential confounders were examined. HoNOS subscales that are associated with increased mortality risk were included in subsequent adjusted analyses. In the adjusted analyses, three levels of adjustment were used: the first model included only age and gender; the second model also included ethnicity and deprivation in area of residence (i.e. all demographic variables). The third and final model included all variables in the second model plus all HoNOS subscale ratings.

Results

We identified 4296 cases of PD, of whom 2440 (56.8%) had at least one HoNOS rating in the observation period. Having at least one HoNOS was not associated with death within the observation period or with gender, but it was associated with older age [mean age (standard deviation) 38.2 (13.0) vs. 36.0 (12.9); $p<0.001$]. Therefore a total of 2,440 cases with PD formed the analysed cohort, of whom 85 (3.4%) died within the 5-year observation period. The mean follow-up period was 985.5 (SD 550.6) days. Of the 85 deaths, 16 required scrutiny of free-text data in order to classify natural or unnatural cause of death, which remained unknown in 6 cases. Of the 79 deaths with known cause, 49 (62%) were from natural causes and 30 (38%) were from unnatural causes. Table 1 displays number of cases and deaths from all causes by cohort characteristics, and unadjusted hazard ratios. Older age was associated with increased mortality risk, and African, Caribbean or other black ethnic group was associated with decreased risk. HoNOS subscales associated with increased mortality risk were overactivity / aggression, drinking / drug use, physical illness / disability, and problems with ADL. HoNOS subscales that were not associated with mortality risk were omitted from the subsequent adjusted models (Tables 2–4), with the exception of non-accidental injury, because self-injury is a

Table 2. Cox regression analyses of factors associated with all-cause mortality amongst individuals with personality disorder.

Risk Factors	Hazard Ratio (95% CI)		
	Adjusted for age[†] and gender	Adjusted for all demographic[a] factors	Fully adjusted[b]
Non-accidental self injury			
Not a problem	Referent	Referent	Referent
Subclinical, minor problem	0.8 (0.4–1.7)	0.8 (0.4–1.6)	0.7 (0.3–1.4)
Mild problem	1.5 (0.8–3.0)	1.5 (0.7–2.8)	1.0 (0.5–1.9)
Severe/very severe problem	2.1 (1.1–3.8)*	2.0 (1.1–3.8)*	1.3 (0.7–2.5)
Overactivity and aggression			
Not a problem	Referent	Referent	Referent
Subclinical, minor problem	1.7 (1.0–2.8)*	1.6 (1.0–2.7)	1.6 (1.0–2.7)
Mild problem	1.4 (0.7–2.5)	1.4 (0.7–2.5)	1.1 (0.6–2.1)
Severe/very severe problem	1.5 (0.7–3.0)	1.6 (0.8–3.2)	1.0 (0.5–2.1)
Drinking or drug use			
Not a problem	Referent	Referent	Referent
Subclinical, minor problem	0.7 (0.3–1.7)	0.7 (0.3–1.7)	0.6 (0.3–1.6)
Mild problem	2.4 (1.3–4.3)**	2.3 (1.3–4.2)**	2.1 (1.1–3.9)*
Severe/very severe problem	2.7 (1.6–4.6)***	2.8 (1.6–4.7)***	2.3 (1.3–4.1)**
Physical illness or disability			
Not a problem	Referent	Referent	Referent
Subclinical, minor problem	1.4 (0.7–2.7)	1.4 (0.7–2.6)	1.3 (0.7–2.5)
Mild problem	1.4 (0.7–2.6)	1.3 (0.7–2.5)	1.2 (0.6–2.3)
Severe/very severe problem	3.0 (1.7–5.3)***	2.8 (1.6–5.0)***	1.9 (1.0–3.6)*
Activities of daily living			
Not a problem	Referent	Referent	Referent
Subclinical, minor problem	0.9 (0.5–1.7)	0.9 (0.5–1.7)	0.9 (0.5–1.6)
Mild problem	1.5 (0.8–2.6)	1.5 (0.9–2.7)	1.2 (0.7–2.1)
Severe/very severe problem	2.7 (1.5–4.8)**	2.8 (1.5–5.0)**	1.9 (1.0–3.6)*

[†]Entered as a continuous variable in all models.
[a]Demographic factors = age, gender, ethnicity, deprivation.
b Adjusted for demographic factors and all other variables that appear in this table.
*$p<0.05$;
**$p<0.01$;
***$p<0.001$.
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prevalent problem in people with PD and is also a well-established predictor of mortality in previous studies [22,27].

All-cause mortality – adjusted models

Tests of the proportional hazards assumption indicated there was no violation and thus it was appropriate to proceed with Cox regression modelling. Table 2 displays Cox regression analyses of associations between clinical variables and all-cause mortality at three levels of adjustment – 1) adjusted for age and gender; 2) adjusted for age, gender, ethnicity and deprivation in area of residence (i.e. all demographics); and 3) adjusted for all demographics and all HoNOS subscales other than the exposure in question. Age was entered as a continuous variable in the models. All-cause mortality was associated with drinking / drug use, physical illness / disability, and problems with ADL at the first two levels of adjustment. All these associations were attenuated in the fully adjusted model, but they remained statistically significant. An association between the non-accidental injury subscale and all-cause mortality was observed after the first level of adjustment (age and gender); however at subsequent levels of adjustment it was no longer significant. An association between overactivity / aggression and all-cause mortality was observed in the first two models, but was no longer significant after adjusting for other HoNOS subscales.

Natural cause mortality – adjusted models

Table 3 summarises Cox regression models of factors associated with natural cause mortality. As in Table 2, three levels of adjustment are shown. The non-accidental injury and overactivity / aggression HoNOS subscales were not associated with natural cause mortality. Mild and severe drinking / drug use were both associated with natural cause mortality across the first two adjusted models; however in the fully adjusted model only mild drinking / drug use remained significant. Severe physical illness / disability was associated with natural cause mortality across all three models. Severe problems with ADL was associated with natural cause mortality in the first two models, but was not significant in the final model.

Table 3. Cox regression analyses of factors associated with natural cause mortality amongst individuals with personality disorder.

Risk Factors	Number of individuals (Number of natural deaths)	Hazard Ratio (95%CI)		
		Adjusted for age[†] and gender	Adjusted for all demographic[a] factors	Fully adjusted[b]
Non-accidental self injury				
Not a problem	1404 (33)	Referent	Referent	Referent
Subclinical, minor problem	389 (4)	0.7 (0.2–1.9)	0.7 (0.2–1.9)	0.7 (0.2–2.1)
Mild problem	311 (8)	2.2 (1.0–4.9)	2.2 (1.0–5.0)	1.4 (0.6–3.3)
Severe/very severe problem	325 (4)	1.2 (0.4–3.4)	1.2 (0.4–3.6)	0.7 (0.2–2.3)
Overactivity and aggression				
Not a problem	1123 (18)	Referent	Referent	Referent
Subclinical, minor problem	659 (14)	1.3 (0.7–2.7)	1.3 (0.6–2.5)	1.2 (0.6–2.4)
Mild problem	379 (11)	1.3 (0.6–2.9)	1.3 (0.6–2.9)	0.9 (0.4–2.0)
Severe/very severe problem	270 (6)	1.4 (0.6–3.6)	1.6 (0.6–4.1)	1.0 (0.4–2.7)
Drinking or drug use				
Not a problem	1447 (26)	Referent	Referent	Referent
Subclinical, minor problem	305 (4)	1.1 (0.4–3.1)	1.0 (0.4–3.0)	1.0 (0.3–3.0)
Mild problem	298 (10)	3.8 (1.8–8.3)**	3.8 (1.7–8.4)**	3.4 (1.5–7.4)**
Severe/very severe problem	363 (9)	2.9 (1.3–6.4)*	2.9 (1.3–6.7)*	2.4 (1.0–5.8)
Physical illness or disability				
Not a problem	1484 (12)	Referent	Referent	Referent
Subclinical, minor problem	363 (10)	1.8 (0.8–4.3)	1.8 (0.7–4.3)	1.8 (0.8–4.4)
Mild problem	322 (6)	0.9 (0.3–2.6)	0.8 (0.3–2.3)	0.8 (0.3–2.2)
Severe/very severe problem	253 (21)	3.7 (1.7–8.0)**	3.5 (1.6–7.7)**	2.4 (1.0–5.6)*
Activities of daily living				
Not a problem	1179 (15)	Referent	Referent	Referent
Subclinical, minor problem	584 (7)	0.7 (0.3–1.8)	0.7 (0.3–1.7)	0.7 (0.3–1.6)
Mild problem	453 (11)	1.4 (0.6–3.1)	1.4 (0.7–3.2)	1.1 (0.5–2.4)
Severe/very severe problem	200 (16)	3.0 (1.4–6.3)**	3.2 (1.5–6.8)**	2.2 (0.9–4.9)

[†]Entered as a continuous variable in all models.
[a]Demographic factors = age, gender, ethnicity, deprivation.
[b]Adjusted for demographic factors and all other variables that appear in this table.
*$p<0.05$;
**$p<0.01$;
***$p<0.001$.
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Unnatural cause mortality – adjusted models

Table 4 displays Cox regression models examining factors associated with unnatural cause mortality. Only severe drinking / drug use was associated with this outcome, an association which was significant across all three models.

Discussion

In this large clinical cohort of people with a diagnosis of personality disorder, monitored over a 5-year period, more than fifty percent of deaths were accounted for by natural causes. Alcohol or drug use, physical illness, and impairment in ADL were all independently associated with all-cause mortality. Mortality from natural causes was independently associated with mild problems in alcohol or drug use, and severe physical illness, while unnatural cause mortality was predicted only by severe alcohol or drug use. Against our expectations, we did not find an association between the HoNOS subscale assessing non-accidental self-injury and any mortality outcome.

No previous research has investigated clinical predictors of either all-cause or cause-specific mortality in individuals with PD. Mortality studies in PD have instead almost exclusively investigated deaths from unnatural causes, particularly within borderline PD [28,29]. In borderline PD, depression, substance use disorder and antisocial PD (or traits) are associated with higher risk of completed suicide [28,29]. However, despite the increased recognition of natural causes underlying excess mortality in people with mental disorders [30,31,32], no previous study has investigated deaths from natural causes among people with PD.

The recent Nordic psychiatric case register study by Nordentoft et al found that, in a cohort of over 270,000 patients with diagnoses of schizophrenia spectrum disorders, affective disorders, substance abuse or personality disorder, those with substance abuse or personality disorder had the most reduced life expectancy compared to the general population [6]. This chimes with the findings of previous mortality studies in psychiatric populations [7,8,33,34]. Both substance abuse and PD are associated with deaths from diseases and medical conditions (i.e. natural causes)

Table 4. Cox regression analyses of factors associated with unnatural cause mortality amongst individuals with personality disorder.

Risk Factors	Number of individuals (Number of unnatural deaths)	Hazard Ratio (95%CI)		
		Adjusted for age[†] and gender	Adjusted for all demographic[a] factors	Fully adjusted[b]
Non-accidental self injury				
Not a problem	1404 (15)	Referent	Referent	Referent
Subclinical, minor problem	389 (5)	1.3 (0.5–3.5)	1.2 (0.4–3.3)	1.0 (0.3–2.8)
Mild problem	311 (3)	1.0 (0.3–3.6)	0.9 (0.3–3.2)	0.7 (0.2–2.7)
Severe/very severe problem	325 (7)	2.5 (1.0–6.2)	2.3 (0.9–5.8)	1.5 (0.6–4.1)
Overactivity and aggression				
Not a problem	1123 (11)	Referent	Referent	Referent
Subclinical, minor problem	659 (12)	1.9 (0.8–4.2)	1.9 (0.8–4.3)	1.8 (0.8–4.1)
Mild problem	379 (3)	0.8 (0.2–3.0)	0.9 (0.2–3.2)	0.8 (0.2–3.0)
Severe/very severe problem	270 (4)	1.6 (0.5–5.0)	1.5 (0.5–4.8)	1.0 (0.3–3.5)
Drinking or drug use				
Not a problem	1447 (14)	Referent	Referent	Referent
Subclinical, minor problem	305 (1)	0.4 (0.0–2.7)	0.3 (0.0–2.5)	0.3 (0.0–2.5)
Mild problem	298 (4)	1.4 (0.5–4.4)	1.3 (0.4–4.0)	1.3 (0.4–4.1)
Severe/very severe problem	363 (11)	3.2 (1.4–7.1)**	3.2 (1.4–7.1)**	3.1 (1.3–7.3)*
Physical illness or disability				
Not a problem	1484 (15)	Referent	Referent	Referent
Subclinical, minor problem	363 (3)	0.8 (0.2–2.9)	0.8 (0.2–2.8)	0.7 (0.2–2.5)
Mild problem	322 (8)	2.4 (1.0–5.9)	2.4 (1.0–2.8)	2.1 (0.9–5.3)
Severe/very severe problem	253 (4)	1.7 (0.5–5.2)	1.5 (0.5–4.7)	1.1 (0.3–3.7)
Activities of daily living				
Not a problem	1179 (12)	Referent	Referent	Referent
Subclinical, minor problem	584 (8)	1.3 (0.5–3.1)	1.3 (0.5–3.2)	1.2 (0.5–3.1)
Mild problem	453 (7)	1.5 (0.6–3.7)	1.5 (0.6–3.8)	1.2 (0.5–3.2)
Severe/very severe problem	200 (3)	1.5 (0.4–5.4)	1.5 (0.4–5.3)	1.2 (0.3–4.5)

[†]Entered as a continuous variable in all models.
[a]Demographic factors = age, gender, ethnicity, deprivation.
[b]Adjusted for demographic factors and all other variables that appear in this table.
*p<0.05;
**p<0.01;
***p<0.001.
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and with deaths from suicides, accidents and homicides (i.e. unnatural causes) [6,33]. In our cohort of patients with PD, we found that higher scores on the HoNOS subscale assessing alcohol or drug use was associated with a two- to three-fold increased risk of death (both natural and unnatural). Deaths from accidents, homicides and suicides (i.e. unnatural causes) in patients abusing alcohol and/or illicit drugs might be explained by greater impulsivity, their involvement in a violent subculture or other risk behaviours. Considering natural causes of death, alcoholism is strongly linked with gastrointestinal disease, chiefly cirrhosis and peptic ulceration, whilst drug abuse is associated with viral infections, particularly hepatitis and HIV. It is noteworthy, however, that mild rather than severe alcohol or drug use predicted death from natural causes. One possible explanation for this finding is that substance use rated as mild in severity is more likely to go untreated. Similar mechanisms may help to explain an association between subclinical depression and mortality in patients with serious mental illness [35]. Another possibility is that those people with PD and severe alcohol or drug use who present to clinical services represent relatively healthy survivors, which would obscure any association with later mortality risk.

The detected association between all-cause and natural cause mortality with physical illness is unsurprising. PD is associated with poor health [12], and physical ill-health from unhealthy lifestyles, undertreated medical conditions and harmful side effects of medications are known to reduce life expectancy in people with mental disorders [36,37]. Previous studies have reported substantially reduced life expectancy among individuals who self-harm [27], and frequency of self-harm is associated with increased risk of suicide [22]. In contrast, our study found no independent association between the HoNOS subscale on self-harm and mortality. Similarly, although high rates of violent behaviour in individuals with PD are a focus for clinical and public concern [1] and associations have been reported between hostility and mortality in cardiovascular disease [11], we found no association between overactivity and aggression, and mortality. On the other

hand, difficulties with ADL independently predicted all-cause mortality. Together with the null findings with respect to self-harm and aggression, this is consistent with research showing that, in some cohorts, self-neglect may be a stronger predictor of mortality than more obvious risk factors such as suicide or violence [38]. It is also consistent with other research showing that ADL impairment is independently predictive of all-cause mortality among individuals with severe mental illness [24]. ADL impairment is therefore a potentially important marker of vulnerability in individuals with PD and further investigation is needed into the extent to which this is accounted for by poor psychosocial functioning and consequent chronic social disadvantage through social isolation and unemployment.

To our knowledge, this is the first study to investigate clinical predictors of all-cause and cause-specific mortality in individuals with personality disorder. A key strength of the study was the use of a large, representative clinical cohort, covering a broad age range and patients accessing various points of secondary care (inpatient admission, community care or one-off emergency presentation), increasing generalisability to other secondary care settings. We examined a wide range of clinical variables as exposures of interest, and included important potential demographic and socioeconomic confounders. The mortality data were drawn from death certification which is a legal requirement across the UK; under-ascertainment of deaths is therefore likely to be very low and only deaths occurring outside the UK are likely to be missed. However, the findings need to be considered in the light of certain limitations. Some measurement error is possible among demographic, socioeconomic as well as clinical variables (i.e. HoNOS items) when using routinely collected case record data; however, we would expect that any measurement error would be essentially random, so unlikely to introduce bias. Although we accounted for a wide range of clinical and socio-demographic variables, there may be residual confounding. In particular, we did not include frequency/intensity of service contact or account for possible effects of pharmacological or psychosocial interventions. Level of service contact and interventions may have a bearing on symptoms and health [39], either positively or negatively, which can contribute to mortality risk. Duration of illness and smoking are further variables that were not accounted for. A further limitation is the lack of power for examining more specific causes of death. Finally, we acknowledge that a large number of people with PD do not present to mental health services and are either managed in primary care or within general medical services. Our findings therefore only apply to secondary mental health service users.

Our findings are important and have clear implications for clinical practice. People with personality disorder are acknowledged to have reduced life expectancy [5], and this study has identified that the most risky subset of patients are those with alcohol and drug problems, poor physical health, and severe functional impairment. Each of these risk factors now demands attention.

The physical health status of patients with personality disorder should be regularly reviewed. We do not think that such a basic principle can be overstated, because we know that compared with members of the general population, people with mental health problems receive poorer physical healthcare [40]. Moreover, this problem is likely to be particularly pertinent to service users with a personality disorder, because they are often perceived to be 'difficult' [41] and not deserving of care [42]. Functional impairment is an enduring feature of most forms of personality disorder [43] and should therefore be a central component of the clinical assessment of people with suspected personality disorder. Finally, apparently mild problems with drugs and alcohol was the strongest predictor of mortality to emerge from our study, confirming the importance of taking an alcohol and drug history from personality-disordered patients, including those without conspicuous alcohol- and drug-related problems [35,38].

Author Contributions

Conceived and designed the experiments: MF RS RH PM. Performed the experiments: MF RH. Analyzed the data: MF. Contributed to the writing of the manuscript: MF RS RH PM.

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Chapter 4 The impact of co-morbid personality disorder on use of psychiatric services and involuntary hospitalization in people with severe mental illness

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ORIGINAL PAPER

The impact of co-morbid personality disorder on use of psychiatric services and involuntary hospitalization in people with severe mental illness

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Abstract
Purpose To examine the impact of co-morbid personality disorder (PD), on inpatient and community-based service use and risk of involuntary hospitalization, amongst patients with severe mental illness (SMI).
Methods We identified SMI cases (schizophrenia, schizoaffective and bipolar disorder) with and without co-morbid PD, and PD cases, aged ≥18 years, in a large secondary mental healthcare case register. Using multivariable logistic regression, we examined the association between co-morbid PD and high level of inpatient and community-based service use (defined as the top decile of service use), and involuntary hospitalization, respectively, adjusting for socio-demographics, clinical symptoms and social functioning.
Results Severe mental illness patients with co-morbid PD (SMI-PD) ($n = 961$) had more severe symptoms and social functioning problems compared to SMI patients without PD ($n = 10{,}963$) and patients who had PD but no concurrent SMI ($n = 2{,}309$). A greater proportion of SMI-PD patients were high inpatient service users (22.4 vs. 10.1 %). This association was attenuated but remained significant, after adjustment (fully adjusted odds ratio, OR 2.31, 95 % CI 1.88–2.84). The association between SMI-PD and high community-based service use was confounded by symptoms and social functioning. Compared to patients with SMI, SMI-PD patients were significantly more likely to experience involuntary hospitalization (fully adjusted OR 1.56, 95 % CI 1.31–1.85).
Conclusions In SMI patients, co-morbidity with PD is robustly associated with both high use of inpatient psychiatric services and an increased likelihood of involuntary hospitalization. Patients with SMI and co-morbid PD are likely to require tailored interventions that target both the underlying personality pathology as well as the Axis I disorder.

Keywords Personality disorders · Severe mental illness · Co-morbidity · Health services · Involuntary hospitalization

Introduction

Personality disorder (PD) is prevalent among patients with severe mental illness (SMI) [1] where it has been shown to be independently associated with both suicidal [2] and violent behaviour [3]. Moreover people with PD are more likely to report poor physical health [4] and are at substantially increased risk of mortality compared to the general population [5]. From a service perspective, studies of cohorts of patients with SMI have found that those with co-morbid PD spend more time in hospital [6, 7]. However, the full impact of co-morbid PD on community and hospital-based service utilization by patients with SMI has not been described. Moreover, the factors underlying an association between co-morbid PD and increased service use in patients with SMI are not well understood. Apart from diagnosis [8], heavy service use amongst people with mental disorder is associated with alcohol and drug use, non-adherence with medication [9], homelessness and

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other socio-demographic variables [10], as well as violence [11]. Some or all of these variables may confound or mediate an association between co-morbid PD and heavy service use in SMI, but no study has examined the impact of controlling for these covariates.

In this study we used a large historic cohort to examine the impact of co-morbid PD on the use of psychiatric services among patients with SMI. For comprehensiveness, we measured both inpatient and community-based service use, and took into account a range of socio-demographic, clinical and social functioning variables. SMI predominates amongst patients who are involuntarily hospitalized [12]. Given that involuntary hospitalization is associated with level of inpatient service use and has an important bearing on clinical outcomes [13], a further objective of this study was to determine whether co-morbid PD is associated with increased involuntary hospitalization amongst patients with SMI—an association which has also not previously been examined.

Methods

Setting

The study was based in South London and Maudsley NHS Foundation Trust (SLaM), a state-funded, secondary mental healthcare provider with close to 100 % monopoly in serving an aggregate population of 1.2 million people living in four London boroughs (Lambeth, Southwark, Lewisham and Croydon). SLaM services include inpatient and community-based care, as well as psychiatric liaison services to general hospitals, and forensic, old age, child and adolescent, addictions, and learning disability mental health teams. The SLaM Biomedical Research Centre (BRC) Case Register provides anonymised in-depth information derived from SLaM's electronic clinical record system. The development and protocol of this case register has been described in detail in a previous open access publication [14], and the case register has been used extensively in previous research [15, 16]. Electronic clinical records have been used comprehensively across all SLaM services since 2006 and the BRC Clinical Record Interactive Search (CRIS) system was developed in 2008 to allow searching and retrieval of anonymised information from full clinical records with over 200,000 cases currently represented on the system. CRIS was approved as a data resource for secondary analysis by the Oxfordshire Research Ethics Committee (reference 08/H0606/71).

Sample

The cohort assembled for this study consisted of individuals from three mutually exclusive diagnostic groups—(1) SMI; (2) PD; and (3) SMI co-morbid with PD (SMI-PD). Diagnoses were based on the 10th edition of the World Health Organisation International Classification of Diseases (ICD-10) [17]. Patients were considered to have SMI if they had been given a lifetime diagnosis of schizophrenia (ICD-10 code: F20), schizoaffective disorder (F25) or bipolar affective disorder (F31) at any time before the end of the study period. Patients with PD had a lifetime diagnosis of any of the ICD-10 categories of PD diagnosis (F60.0–F61.0). Individuals were classified as having SMI and PD co-morbidly if they had been given both an SMI diagnosis and a PD diagnosis during the study period. Diagnoses were taken from a structured field in the Case Register and supplemented by the appearance of diagnoses in free text, extracted using Generalised Architecture for Text Engineering (GATE) software [18].

All individuals aged 18 or over within the case register that had been given diagnoses falling in any of these groups, and had received SLaM services within the five-year study period from 1 January 2007 to 31 December 2011, were included. The beginning of 2007 was chosen as a starting point for the study because this corresponded to the most complete recording of clinical data on the Case Register. Individuals diagnosed with an organic disorder or with mental retardation, within the observation period, were excluded from the study. We also excluded from the SMI-PD group any individuals with paranoid or schizoid PD ($n = 74$), as these diagnoses should not be made in the presence of a primary psychotic diagnosis such as schizophrenia.

In order to examine the validity of the PD diagnoses in the Case Register, 50 cases with or without a PD diagnosis were randomly selected from our cohort. Case note documents for the 50 individuals were then independently processed to mask all diagnosis information. These 50 cases were subsequently rated by a trained psychiatrist (MF; who was blind to the original diagnostic information) for the presence or absence of PD. The kappa coefficient for level of agreement between the case register diagnosis and blind clinical rating of the case records was 0.72 ($p < 0.001$).

Main outcome measures

Measures of each individual's mental health service use with respect to hospitalization, community-based contact, and involuntary hospitalization were determined by selective and systematic data extraction from the case register. For each patient, the observation period began on the 1st January 2007 or the dates of their first recorded event on the case register from that day onwards, whichever was later. Observation ended on 31st December 2011 or the date of death, whichever was earlier.

Inpatient service use The time in days that each individual had spent hospitalized as an inpatient was

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calculated, as a proportion of the duration of his/her observation period. Patients ranking in the top decile on this measure were considered to be high users of inpatient services.

Community-based service use Community-based contact was defined as a clinical event in which the patient had face-to-face contact with a healthcare worker in any SLaM service other than inpatient units. The time in days in which each individual had community-based contact (i.e. count of each day in which there was contact) was calculated, as a proportion of the duration of his/her observation period. Patients ranking in the top decile on this measure were considered to be high users of community-based services.

Involuntary hospitalization The Mental Health Act provides the legislative framework by which people in England and Wales diagnosed with mental disorder can be detained in hospital or police custody and be assessed and treated with respect to their disorder, against their wishes. Use of the Mental Health Act is routinely recorded on the case register. Thus, for each patient in the cohort we were able to ascertain whether he/she had been involuntarily hospitalized at any point within the observation period. This was used as a dichotomous outcome (detained vs. not detained) in the analysis.

Explanatory variables

Demographic and socioeconomic factors

Date of birth, gender, ethnicity, relationship status, and employment status were defined from routinely completed fields on the source records. Age was calculated from the beginning of the patient's observation period. Ethnicity classifications were: "White British or other white background", "East Asian", "South Asian", "African, Caribbean or other black background", and "Mixed, unknown, and others". Relationship status was classified as being in a current relationship (cohabiting, married or civil partner) or no current relationship (divorced, civil partnership dissolved, separated, single, widow/surviving civil partner or unknown). Employment status was classified as being in paid employment (part-time or full-time paid employment, self employed), or not in paid employment (unemployed, registered disabled, retired, full-time student including tertiary or school age, government training scheme, volunteer, not known, other).

We used an area-level index of multiple deprivation to measure socioeconomic status, calculated at the level of lower super output area for the residence (LSOA)—a UK address-grouping construct which contains an average of 1,500 residents. The patient's address in England that was recorded closest in time to the beginning of the observation period was used to obtain deprivation scores. The index of multiple deprivation is derived from a range of domains applied to the area including: employment, income, education, health, barriers to housing and services, crime and the living environment. Each domain is given a specific weighting to reflect its overall importance in the calculation of this index. Moreover, each domain is made up of a number of specific indicators that reflect different aspects of the deprivation they are intended to measure. Increasing scores in the index of multiple deprivation are indicative of more severe deprivation. In this analysis, deprivation scores were divided into tertiles. A separate category was given for homelessness.

Symptoms and social functioning

We rated for the presence and severity of symptoms, as well as social functioning problems using the Health of the Nations Outcome Scale (HoNOS), a well-validated, 12-item, clinician-administered measure [19–21]. Eight of the 12 items assess clinical symptoms—(1) overactive, aggressive, disruptive or agitated behaviour; (2) non-accidental self-injury; (3) problem-drinking or drug-taking; (4) cognitive problems; (5) physical illness or disability problems; (6) problems associated with hallucinations and delusions; (7) problems with depressed mood; (8) other mental and behavioural problems. The remaining four items cover social functioning—(9) problems with relationships; (10) problems with activities of daily living; (11) problems with living conditions; (12) problems with occupation and activities. The 12 items have operationalized response options that follow the format of 0 "not a problem"; 1 "subclinical, minor problem requiring no action", 2 "mild problem but definitely present", 3 "moderately severe problem", and 4 "severe to very severe problem" [22]. In this analysis we used items from the first HoNOS questionnaire that was completed during the observation period as measures of baseline level of symptoms and social functioning in each patient. Due to small numbers in some categories, for the purposes of data analysis, all HoNOS items were collapsed into two categories: (0–2) not a problem, subclinical, or mild problem, and (3–4) severe or very severe problem. Overall, 79.7 % of patients in the study received at least one HoNOS assessment during the observation period. Due to incomplete data for some covariates, the final fully-adjusted models had analytic samples that were reduced compared to the crude models. However, incomplete data were evenly distributed between the exposure groups.

Statistical analysis

All analyses were undertaken using STATA 11 [23]. We used multivariate logistic regression to model the effect of

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different diagnosis categories on the three outcomes (inpatient service use, community-based service use, and involuntary hospitalization), adjusting for possible explanatory variables. We present crude and adjusted odds ratios with 95 % confidence intervals derived from logistic regression models. In all three cases, the first logistic regression model included only diagnosis as an explanatory variable. The second model also included demographic factors (age, gender, ethnicity, relationship status) and socioeconomic factors (deprivation in area of residence and employment) were subsequently added to the model. In the third and final model of predictors of service use, we added symptoms and social functioning as covariates to the model. In modelling predictors of involuntary hospitalization, we also adjusted for length of observation period.

We conducted two sets of sensitivity analyses. The first set involved using 5 and 15 % as alternative definitions to the original top 10 % cut-off for defining high inpatient and community-based service use. The second set of sensitivity analyses used inpatient and community-based service use as continuous variables, and modelled these using linear regressions. The service use data were highly skewed and, therefore, we log-transformed these data (resulting in the data approximating a normal distribution) before developing the two linear regression models.

Results

A total of 14,233 individuals were identified by CRIS, using our criteria for inclusion into the study. The cohort was 54.3 % male and had a mean age of 41.9 years (standard deviation 14.7 years). In terms of ethnic background, 53.8 % were white, 30.4 % were African, Caribbean or other black background, 2.9 % were East Asian, 2.6 % were South Asian, and 10.3 % were mixed or unknown. Twelve percent of the cohort had a cohabiting, married or in a civil partnership relationship status and 2.4 % of the cohort was classified as homeless. Only 4.2 % of the cohort were in paid employment; 5.9 % of the cohort died before the end of the study observation period (31st December 2011).

Of the 14,233 individuals, 10,963 were in the SMI group, 2,309 in the PD group, and 961 in the SMI-PD group. Table 1 provides the demographic and socioeconomic characteristics of the patients included in the study, according to the three diagnosis groups. Compared to the SMI group, a larger proportion of the SMI-PD group was younger, from a white ethnic background and was homeless and a smaller proportion was in a relationship.

Differences were noted in the HoNOS sub-scale profiles between the SMI and SMI-PD groups. Compared to the SMI group, the SMI-PD group had a higher proportion of individuals with severe or very severe problems in five of eight symptom domains—overactivity and aggression (13.5 vs. 6.8 %; $p < 0.001$); non-accidental injury (8.3 vs. 1.7 %; $p < 0.001$); depressed mood (13.7 vs. 6.5 %; $p < 0.001$); problem drinking or drug-taking (16.3 vs. 6.2 %; $p < 0.001$); other mental health problem (23.7 vs. 14.3 %; $p < 0.001$). They also had a greater proportion of individuals with severe problems compared to the SMI group, in three of four social functioning domains—occupational (14.2 vs. 9.3 %; $p < 0.001$); living conditions (11.5 vs. 6.9 %; $p < 0.001$); and relationship problem (19.7 vs. 10.3 %; $p < 0.001$). In the remaining three clinical domains (hallucinations and delusions, cognitive problems, physical illness or disability) and one social functioning domain (activities of daily living) the two groups were comparable.

Table 2 shows the measures of psychiatric service use amongst the three diagnosis groups. Five thousand six hundred and eight individuals (39.4 % of total cohort) had at least one inpatient admission during the study period. The PD group had proportionately fewer patients (26.9 %), and the SMI-PD group had proportionately more patients (63.1 %) admitted as an inpatient, compared to the SMI group (40.0 %). Those in the top 10 % of inpatient service use (as a proportion of length of observation period) spent an average of 136.4 days per year in hospital. Amongst the three diagnosis groups, the SMI-PD group had the highest proportions of high users of inpatient services (22.4 %) and high users of community-based services (13.6 %), respectively. This group also had the highest prevalence of individuals experiencing involuntary hospitalization (41.8 %). In contrast, the PD group had the lowest proportions of high users of both inpatient (4.5 %) and community-based (5.4 %) services, as well as involuntary hospitalization (10.7 %).

Table 3 displays the results of multivariate logistic regression for high inpatient service use. Individuals with SMI and co-morbid PD were twice as likely to be high users of inpatient services compared to individuals with SMI without co-morbid PD (crude odds ratio 2.57, 95 % confidence interval 2.18–3.03, p value <0.001). Adjustment for demographic and socioeconomic factors did not attenuate the association and addition of baseline severity of symptoms and social functioning problems to the model had little impact on the strength of the association (fully adjusted odds ratio 2.31, 95 % confidence interval 1.88–2.84, p value <0.001).

The equivalent regression model for high community-based service use is shown in Table 4. Co-morbid PD conferred a small but significant increase in the odds of high service use (crude odds ratio 1.32, 95 % confidence interval 1.09–1.61, p value <0.05). This association was not attenuated by adjustment for demographic and socioeconomic factors. However, the addition of clinical and social functioning problems to the model rendered the odds

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Table 1 Demographic and socioeconomic characteristics of patients with severe mental illness (SMI), personality disorder (PD), and SMI co-morbid with PD (SMI-PD)—groups are mutually exclusive

Characteristics	SMI (n = 10,963)		PD (n = 2,309)		SMI-PD (n = 961)	
	n	% (95 % CI)	n	% (95 % CI)	n	% (95 % CI)
Age						
15–29	2,225	20.3 (19.5–21.0)	792	34.3 (32.4–36.2)	342	35.6 (32.6–38.6)
30–44	4,363	39.8 (38.9–40.7)	965	41.8 (39.8–43.8)	417	43.4 (40.3–46.5)
45–64	3,280	29.9 (29.1–30.8)	480	20.8 (19.1–22.4)	187	19.5 (17.0–22.0)
65+	1,095	10.0 (9.4–10.5)	72	3.1 (2.4–3.8)	15	1.6 (0.8–2.3)
Gender						
Female	4,770	43.5 (42.6–44.4)	1,291	55.9 (53.9–57.9)	445	46.3 (43.2–49.5)
Male	6,193	56.5 (55.6–57.4)	1,018	44.1 (42.1–46.1)	516	53.7 (50.5–56.8)
Ethnicity						
White British or other white	5,314	48.5 (47.5–49.4)	1,704	73.8 (72.0–75.6)	641	66.7 (63.7–69.7)
East Asian	355	3.2 (2.9–3.6)	41	1.8 (1.2–2.3)	14	1.5 (0.7–2.2)
South Asian	323	2.9 (2.6–3.3)	35	1.5 (1.0–2.0)	7	0.7 (0.2-1.3)
African, Caribbean or other black	3,883	35.4 (34.5–36.3)	221	9.6 (8.4–10.8)	225	23.4 (20.7–26.1)
Mixed/unknown	1,088	9.9 (9.4–10.5)	308	13.3 (12.0–14.7)	74	7.7 (6.0–9.4)
Married/cohabiting						
No	9,520	86.8 (86.2–87.5)	2,063	89.3 (88.1–90.6)	882	91.8 (90.0–93.5)
Yes	1,443	13.2 (12.5–13.8)	246	10.7 (9.4–11.9)	79	8.2 (6.5–10.0)
Deprivation in area of residence (in tertiles)						
Low deprivation	3,154	28.8 (27.9–29.6)	710	30.7 (28.9–32.6)	257	26.7 (23.9–29.5)
Medium deprivation	3,349	30.5 (29.7–31.4)	697	30.2 (28.3–32.1)	299	31.1 (28.2–34.0)
High deprivation	3,513	32.0 (31.2–32.9)	672	29.1 (27.3–31.0)	269	28.0 (25.2–30.8)
Homeless	229	2.1 (1.8–2.4)	68	2.9 (2.3–3.6)	49	5.1 (3.7–6.5)
Missing/unknown	718	6.5 (6.1–7.0)	162	7.0 (6.0–8.1)	87	9.1 (7.2–10.9)
Employment status						
Not in paid employment or student	10,513	95.9 (95.5–96.3)	2,201	95.3 (94.5–96.2)	928	96.6 (95.4–97.7)
In paid employment	450	4.1 (3.7–4.5)	108	4.7 (3.8–5.5)	33	3.4 (2.3–4.6)

Severe mental illness includes schizophrenia, schizoaffective disorder and bipolar affective disorder

ratio non significant (fully adjusted odds ratio 1.11, 95 % confidence interval 0.89–1.39).

Sensitivity analysis using the top 5 % as cut-off for high service use yielded similar results (adjusted odds ratio (AOR) for inpatient service use associated with co-morbid PD: 2.75, 95 % confidence interval 2.11–3.58; AOR for community-based service use: 0.96, 95 % confidence interval 0.75–1.21); likewise, when using 15 % as alternative cut-off (AOR for inpatient service use: 1.98, 95 % confidence interval 1.64–2.38; AOR for community-based service use 1.08, 95 % confidence interval 0.89–1.30). When we re-ran the analyses using linear regression, the independent effect of co-morbid PD on the inpatient service use of SMI patients was retained (fully adjusted β coefficient 0.28, 95 % confidence interval 0.14–0.41, p value <0.001). The sensitivity analysis for community-based service use showed a smaller but independent effect of co-morbid PD (fully adjusted β coefficient 0.16, 95 % confidence interval 0.07–0.26, p value <0.01).

Table 5 shows the multivariate regression for involuntary hospitalization. SMI patients with co-morbid PD were almost twice as likely to be involuntarily hospitalized compared to SMI patients without co-morbid PD (crude odds ratio 1.83, 95 % confidence interval 1.60–2.09, p value <0.001). Adjustment for demographic and socioeconomic factors, symptoms and social functioning, and length of observation period in the study, did not attenuate this association (fully adjusted odds ratio 1.56, 95 % confidence interval 1.31–1.85, p value <0.001).

Discussion

Main findings

In this cohort of patients accessing secondary mental health services, SMI patients who had co-morbid PD were significantly more likely to be high users of inpatient services,

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Table 2 Indicators of psychiatric service use among patients with severe mental illness (SMI), personality disorder (PD), and SMI co-morbid with PD (SMI-PD)—groups are mutually exclusive

Service use	SMI (n = 10,963)		PD (n = 2,309)		SMI-PD (n = 961)	
	n	% (95 % CI)	n	% (95 % CI)	n	% (95 % CI)
Inpatient admission						
No	6,583	60.0 (59.1–61.0)	1,687	73.1 (71.3–74.9)	355	36.9 (33.9–40.0)
Yes	4,380	40.0 (39.0–40.9)	622	26.9 (25.1–28.7)	606	63.1 (60.0–66.1)
High inpatient service use (top 10 % of sample)[a]	1,104	10.1 (9.5–10.6)	104	4.5 (3.7–5.4)	215	22.4 (19.7–25.0)
High community-based service use (top 10 % of sample)[b]	1,167	10.6 (10.1–11.2)	125	5.4 (4.5–6.3)	131	13.6 (11.5–15.8)
Involuntary hospitalization						
No	7,865	71.7 (70.9–72.6)	2,061	89.3 (88.0–90.5)	559	58.2 (55.0–61.3)
Yes	3,098	28.3 (27.4–29.1)	248	10.7 (9.5–12.0)	402	41.8 (38.7–45.0)

SMI includes schizophrenia, schizoaffective disorder and bipolar affective disorder

[a] Mean = 136.4 days per year; SD ±87.2; range 52.2–365

[b] Mean = 51.5 days per year; SD ±43.1; range 29.6–365

Table 3 Multivariate logistic regression analyses for having high level of inpatient service use—severe mental illness (SMI), personality disorder (PD), and SMI co-morbid with PD (SMI-PD)

Diagnosed mental disorder	Odds ratio (95 % CI)			
	Crude	Adjusted for demographic[a] factors	Adjusted for demographic[a] and socioeconomic[b] factors	Adjusted for demographic[a], socioeconomic[b] factors and symptoms and social functioning[c]
SMI	Referent	Referent	Referent	Referent
PD	0.42 (0.34–0.52)*	0.41 (0.33–0.51)*	0.52 (0.42–0.65)*	0.41 (0.30–0.55)*
SMI-PD	2.57 (2.18–3.03)*	2.43 (2.06–2.88)*	2.62 (2.19–3.14)*	2.31 (1.88–2.84)*

* $p < 0.001$

[a] Demographic factors = age, gender, ethnicity, relationship status

[b] Socioeconomic factors = deprivation in area of residence, employment

[c] Symptoms and social functioning variables include = overactivity and aggression, non-accidental self-injury, hallucinations and delusions, depressed mood, cognitive problem, problem-drinking or drug taking, physical illness or disability, other mental health problem, problem with activities of daily living, social relationships, standard of living conditions, occupational and recreational activities

compared to SMI patients without co-morbid PD. This association remained significant after adjustment for socio-demographic factors and a wide range of clinical and social functioning variables. The presence of co-morbid PD also significantly increased the likelihood of involuntary hospitalization among SMI patients, an association which was not explained by the measured potential confounding variables.

Previous work and possible mechanisms

To the best of our knowledge this is the first study to examine the impact of co-morbid PD on both inpatient and community-based service use of adult patients with SMI. Tyrer and Simmonds [7] reviewed the outcome of three randomised controlled trials that investigated different models of care in SMI, and found in post hoc analyses that patients with co-morbid PD spent more time in hospital compared to those without co-morbid PD, regardless of the model of care. Keown and others investigated psychiatric bed use amongst SMI patients seen in a UK community mental health team, and found that the concurrent presence of PD and also severity of PD were associated with increased psychiatric bed use amongst SMI patients [6, 7]. Our finding that co-morbid PD increases inpatient service use in SMI patients is consistent with existing evidence that co-morbid personality pathology worsens outcomes in SMI [2, 3, 24–27]. The SMI-PD patient group in our study was characterised by a number of factors known to contribute to increased psychiatric service use—more severe psychopathology [25], higher levels of aggression [11] and self-injury [28], greater problems with alcohol and drug use [29, 30], greater problems with housing [11] and occupation, and less stable relationships [31, 32], compared to the SMI group. However, adjustment for these potential confounders had little effect on the strength of the association with inpatient service use.

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Table 4 Multivariate logistic regression analyses for high level of community-based service use—severe mental illness (SMI), personality disorder (PD), and SMI co-morbid with PD

Diagnosed mental disorder	Odds ratio (95 % CI)			
	Crude	Adjusted for demographic[a] factors	Adjusted for demographic[a] and socioeconomic[b] factors	Adjusted for demographic[a] + socioeconomic[b] factors and symptoms and social functioning[c]
SMI	Referent	Referent	Referent	Referent
PD	0.48 (0.40–0.58)**	0.46 (0.38–0.56)**	0.50 (0.41–0.61)**	0.56 (0.44–0.70)**
SMI-PD	1.32 (1.09–1.61)*	1.27 (1.04–1.54)*	1.30 (1.06–1.60)*	1.11 (0.89–1.39)

** $p < 0.001$, * $p < 0.05$

[a] Demographic factors = age, gender, ethnicity, relationship status

[b] Socioeconomic factors = deprivation in area of residence, employment

[c] Symptoms and social functioning variables include = overactivity and aggression, non-accidental self-injury, hallucinations and delusions, depressed mood, cognitive problem, problem-drinking or drug taking, physical illness or disability, other mental health problem, problem with activities of daily living, social relationships, standard of living conditions, occupational and recreational activities

Based on previous work on patients with PD and co-morbid PD [33, 34], one may have expected a similar pattern with regard to community-based services. However, we did not detect an association between co-morbid PD and community-based service use. While we would not expect high inpatient use to exclude high community service use, it may be that some patients had their clinical needs met as an inpatient rather than in the community [35, 36]. Indeed, some individuals in the top decile of inpatient service use spent a great majority of the year in hospital, consequently reducing the amount of time that they could have received community services. Although we know of no other study that has examined both inpatient and community-based service use in adults with a dual diagnosis of SMI and PD, a recent study in adolescents with Axis I psychiatric disorders [36] found that those with co-morbid PD used more inpatient and emergency, but comparable outpatient psychiatric services, compared to those without co-morbid PD.

No study has previously examined the impact of co-morbidity with PD on the risk of involuntary hospitalization in patients with SMI. The combination of personality disorder in the presence of SMI independently increased the risk of involuntary hospitalization. Compared to the SMI group, the SMI-PD group had a higher proportion of individuals with severe clinical problems in five of eight clinical domains, including aggression [37] and non-accidental injury. Levels of social dysfunction were also higher among the SMI-PD group compared to the SMI group. Thus factors associated with increased risk to self and/or others (a criterion for involuntary detention under the English Mental Health Act) were more prevalent in the SMI-PD group compared to those with SMI alone. These factors are very likely to be on the causal pathway to involuntary hospitalization for those with co-morbid PD and the attenuation in the size of the odds ratio which occurred when these covariates were added to the model provides some support for this argument. A diagnosis of personality disorder alone was associated with a lower likelihood of detention in hospital. This is consistent with recommended clinical practice [38], as there is no evidence base to suggest that compulsory treatment in hospital for people with PD improves clinical outcomes.

Strengths and limitations

The study used a large cohort derived from a secondary mental health setting which included the full range of inpatient and community-based services and to our knowledge is the first study of its kind. We accounted for a wide range of covariates, including demographic, socioeconomic, clinical and social functioning variables. Examining both inpatient admission and all community-based service use in the cohort, as well as involuntary hospitalization, offered a fuller and more comprehensive picture of the impact of co-morbid PD in patients with SMI and this adds to the novelty of the findings.

The findings need to be considered in the light of certain limitations. We relied on ICD-10 diagnoses as opposed to standardised assessments, but the use of routinely-collected clinical data allowed us to obtain data on a very large sample size, thus optimising the precision of our findings. Moreover, our use of routine clinical diagnoses in a very large population favours generalisability to real clinical practice. In addition, we established an acceptable level of reliability between the case register diagnoses of personality disorder and blind clinical ratings. Although there were incomplete data in some models, it is unlikely to explain the observed associations, as there was little variation in results across the regression models. In addition, incomplete data were not unevenly distributed among the exposure groups of interest (SMI

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Table 5 Multivariate logistic regression analyses for involuntary hospitalization—severe mental illness (SMI), personality disorder (PD) and SMI co-morbid with PD (SMI-PD)

Diagnosed mental disorder	Odds ratio (95 % CI)						
	Crude	Adjusted for demographic[a] factors	Adjusted for demographic[a] and socioeconomic[b] factors	Adjusted for demographic[a] + socioeconomic[b] factors and symptoms and social functioning[c]	Adjusted for demographic[a] and socioeconomic[b] factors and length of observation period	Fully adjusted[d]	
SMI	Referent	Referent	Referent	Referent	Referent	Referent	
PD	0.31(0.27–0.35)*	0.27 (0.24–0.31)*	0.33 (0.28–0.38)*	0.34 (0.28–0.41)*	0.35 (0.30–0.41)*	0.37 (0.30–0.44)*	
SMI-PD	1.83 (1.60–2.09)*	1.61 (1.40–1.84)*	1.75 (1.51–2.03)*	1.61 (1.35–1.90)*	1.70 (1.46–1.98)*	1.56 (1.31–1.85)*	

* $p < 0.001$

[a] Demographic factors = age, gender, ethnicity, relationship status

[b] Socioeconomic factors = deprivation in area of residence, employment

[c] Symptoms and social functioning variables include = overactivity and aggression, non-accidental self-injury, hallucinations and delusions, depressed mood, cognitive problem, problem-drinking or drug taking, physical illness or disability, other mental health problem, problem with activities of daily living, social relationships, standard of living conditions, occupational and recreational activities

[d] Includes demographic factors, socioeconomic factors, symptoms and social functioning variables, and length of observation period

and SMI-PD). Misclassification of area deprivation level may have occurred for any cohort members who moved during the course of the study. There was a wide distribution of the time from start of observation to first HoNOS rating in the cohort (median 116 days, interquartile range 18–357 days) and this may have influenced the results. The relatively low prevalence of co-morbid PD in the SMI cohort (8.1 %), stands in contrast with prevalence rates reported in other studies [39–42] and indicates that there was under-detection of PD in our sample [24, 43]. On the other hand, it is possible that some cases of PD were misclassified and that the probability of this occurring was dependent upon service use (i.e. that heavy users of services were more likely to attract a diagnosis of PD). If this is the case, then it is possible that we have overestimated the strength of association between co-morbid PD and heavy service use. The historical cohort design means that in some cases, the diagnosis of co-existing PD was made during the course of or in some cases, towards the end of the individual's observation period. This, together with our cross-sectional analysis, limits our ability to make causal inferences.

We conclude that amongst patients with SMI, the co-existence of PD is independently associated with both high use of inpatient psychiatric services and an increased likelihood of involuntary hospitalization. Co-morbid PD is often unrecognised yet, as shown by our data, it is an important prognostic variable. This highlights the importance of routinely assessing personality status in individuals presenting to secondary mental health services [44] with Axis 1 disorders. Patients with SMI and co-morbid PD are likely to require tailored interventions that target both the underlying personality pathology as well as the Axis I disorder. In this respect, better treatment models are required to help to reduce admissions and involuntary hospitalization for patients with SMI and co-morbid Axis II pathology [7, 42, 45].

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Chapter 5 Personality disorder and self-rated health: a population-based cross-sectional survey

This chapter is presented as a published paper and is an exact copy of the following journal publication:

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PERSONALITY DISORDER AND SELF-RATED HEALTH: A POPULATION-BASED CROSS-SECTIONAL SURVEY

Marcella Fok, MB ChB, Matthew Hotopf, PhD, Robert Stewart, MD, Stephani Hatch, PhD, Richard Hayes, PhD, and Paul Moran, MD

Little is known about the impact of personality disorder (PD) on the health of people living in the community. The authors set out to examine the association between PD and general health, using a cross-sectional survey of a representative community sample in London, UK. A total of 1,698 adults aged 16 years or over from 1,075 randomly selected households were recruited and interviewed face-to-face by trained interviewers. Using multivariable logistic regression, the authors examined the cross-sectional association between PD screen status, as assessed by the Standardised Assessment of Personality–Abbreviated Scale (SAPAS), and self-rated health, adjusting for demographic and health covariates. Of the participants, 14.5% screened positively for PD. A greater proportion of those scoring positively for PD reported poor self-rated health, compared to screen negative participants (41.3% versus 15.0%). This association was reduced, but remained significant, after adjustment for potential confounders (unadjusted odds ratio (OR) = 3.99, 95% CI [2.93, 5.42]; fully adjusted OR = 1.53, 95% CI [1.02, 2.29]. Of note, subthreshold symptoms of PD were significantly associated with poor self-rated health (unadjusted OR per unit SAPAS score increment = 1.53, 95% CI [1.40, 1.67]; fully adjusted OR =

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1.19, 95% CI [1.07, 1.33]. Furthermore, people screening positive for PD were more likely to report multiple (three or more) long-standing illnesses. The authors conclude that in the general population, individuals who are at high risk for PD are independently at increased risk of poor general health.

The relationship between mental and physical ill health is one that is both intuitive and borne out by empirical research. Poor physical health increases the risk of mental disorder (Braam et al., 2005; Buist-Bouwman, de Graaf, Vollebergh, & Ormel, 2005; Ostergaard & Foldager, 2011), and a number of prospective studies have demonstrated the existence of a longitudinal association between mental disorder and later physical disorders, including cancer and stroke (Glymour et al., 2012; Oerlemans, van den Akker, Schuurman, Kellen, & Buntinx, 2007). It is now also widely acknowledged that people with mental disorders suffer a disproportionate burden of physical health problems and are at increased risk of early mortality (Chang et al., 2010; Chwastiak, Rosenheck, Desia, & Kazis, 2010; Fok et al., 2012; Grigoletti et al., 2009; Henderson, Hotopf, Shah, Hayes, & Kuh, 2011; von Hausswolff-Juhlin, Bjartveit, Lindstrom, & Jones, 2009). The factors mediating this relationship are thought to be wide ranging and include poor lifestyle, social disadvantage, and unequal access to physical health care.

Individuals with PD are more likely to experience comorbid health problems (Frankenburg & Zanarini, 2006; Moran et al., 2007). However, relatively little is known about the relationship between PD and general health in community populations. Most studies on the impact of PD are limited by their reliance on clinical or help-seeking samples (Frankenburg & Zanarini, 2004; Skodol, Pagano, et al., 2005), their focus on subtypes of PD (El-Gabalawy, Katz, & Sareen, 2010), or their focus on discrete medical conditions as outcomes (Moran et al., 2007). This study sought to investigate the association between PD and self-rated health in a representative community sample.

METHODS

SAMPLE

Participants were community residents in randomly selected households located within the boroughs of Southwark and Lambeth in South East London, all of whom were recruited for the South East London Community Health study (SELCOH), a community survey of psychiatric and physical morbidity of adults in the general population. A detailed description of the aims, design, and methods of the SELCOH is available in an open access publication by Hatch et al. (2011). See Figure 1 for a flow diagram of participant selection. Trained interviewers conducted face-to-face interviews with participants, using a computer-assisted survey questionnaire.

MEASURES

Outcome of Interest—Self-Rated Health. Self-rated health is a measure of subjective health status and an important indicator of general health (Singh-

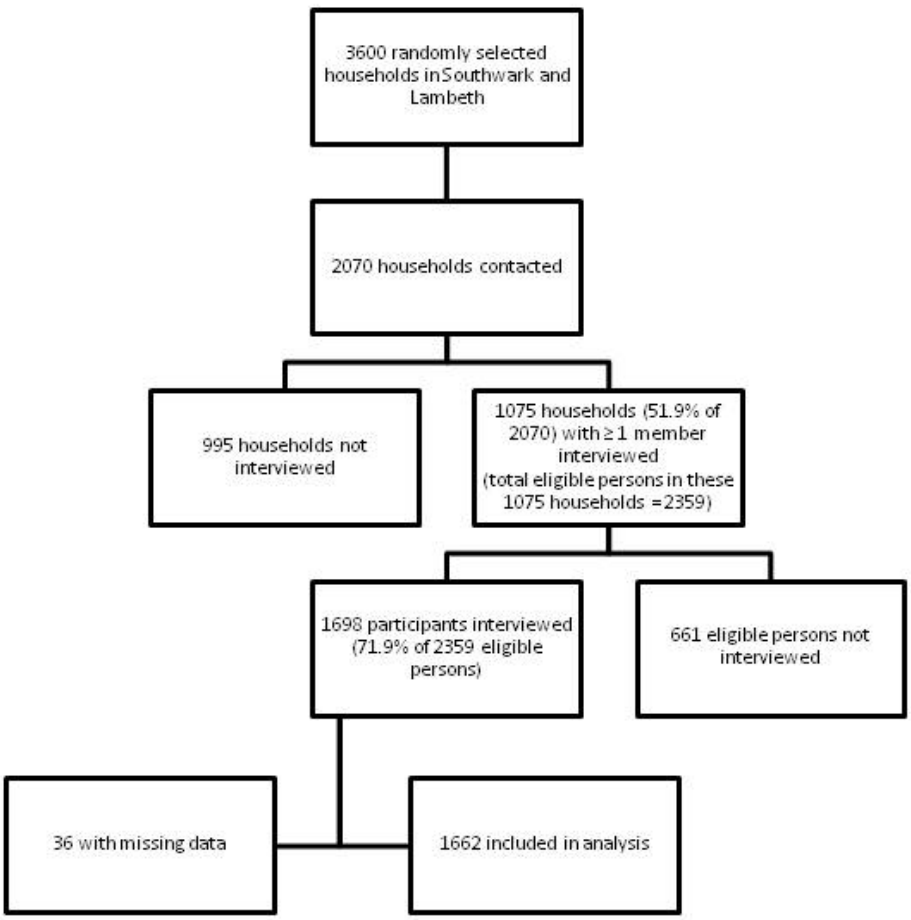

FIGURE 1. Flow diagram of the recruitment of participants for the study.

Manoux et al., 2006). Prospective community-based studies across the world have shown a strong association between self-rated health and mortality even after adjustment for key covariates such as functional status, depression, and comorbidity (DeSalvo, Bloser, Reynolds, He, & Muntner, 2006). In this study, self-rated health was assessed in interview by the question: "How is your health in general? Would you say your health is Excellent, Very good, Good, Fair, or Poor?" For this analysis, self-rated health data were coded into a binary outcome variable with two levels: (1) excellent/very good/good and (2) fair/poor. For ease of reading, these are hereafter referred to in this paper as "good" and "poor" self-rated health, respectively.

Exposure of Interest—Personality Disorder Screen Status. The Standardised Assessment of Personality–Abbreviated Scale (SAPAS) is a rapid screen for

PD, which demonstrates good psychometric properties (Moran et al., 2003) and excellent clinical utility (Bukh, Bock, Vinberg, Gether, & Kessing, 2010; Germans, Van Heck, & Hodiamont, 2012; Gorwood et al., 2010). The SAPAS consists of eight questions, corresponding to a descriptive statement about the person. The full text of the questions can be found in the original SAPAS validation study by Moran et al. (2003). Each question on the SAPAS is scored 0 (No) or 1 (Yes), and the scores on the eight items are added together to produce a total score. In clinical populations, a score of 3 or more has a positive predictive value of .89 at identifying the presence of PD, with a sensitivity of 0.94 and a specificity of 0.85 (Moran et al., 2003). To determine those at high risk for PD in this study, we used a cut-point of 4, which has a slightly better positive predictive value where the prevalence in the population is assumed to be lower, an assumption that befits a community population.

Sociodemographic Variables. Age was recoded into a categorical variable as follows: 16 to 24 years, 25 to 34 years, 35 to 44 years, 45 to 54 years, 55 to 64 years, and 65 years and over. Occupational class was measured by current occupation categorized according to the Registrar General's classification (Office of Population Censuses and Surveys, 1980) into six categories: professional (I), managerial/technical (II), skilled nonmanual (III-NM), skilled manual (III-M), semiskilled (IV) and unskilled (V). For this analysis, occupational class was collapsed into three categories: (a) nonmanual, (b) manual, and (c) no current occupation. The latter category was added to represent those without a current occupation needed to categorize participants in a social class group (approximately 44% of the sample). Self-reported ethnicity was indicated as one of the following groups: White British, Black Caribbean, Black African, Indian, Pakistani, Bangladeshi, or Other. South Asian (i.e., Indian, Pakistani, and Bangladeshi) and Other ethnic groups were collapsed to improve distribution.

Body Mass Index (BMI). Participants had their height and body weight measured at the time of the interview, and these anthropometric measures were used to calculate their BMI. BMI is defined as the individual's body weight in kilograms divided by the square of his or her height in meters. BMI data were recoded into four categories: underweight ($BMI < 18.5$), normal ($18.5 \leq BMI \leq 24.9$), overweight ($25.0 \leq BMI \leq 29.9$), and obese ($BMI \geq 30$).

Exercise. Participants were dichotomized with regard to exercise behavior according to their "yes" or "no" response to the following question: "In the last four weeks, outside of work, have you taken part in any sports or vigorous activities or done any exercises, things like jogging, bike riding, brisk walking, swimming, gym work-out, football, yoga, dancing, climbing or other?"

Alcohol Use. Hazardous alcohol use was measured with the Alcohol Use Disorders Identification Test (AUDIT; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001) developed by the World Health Organization (WHO). The measure comprises 10 questions relating to alcohol consumption, symptoms of alcohol dependence, and problems related to alcohol abuse within the past 12 months. Each item is scored 0–4 with a summed overall score ranging from 0–40. An AUDIT score of 8 or more was used to define hazardous alcohol use (Reinert & Allen, 2002).

Smoking. Smoking behavior was assessed by asking participants whether they had ever smoked, how old they were when they started to smoke regularly, and whether they were a current smoker. Based on their responses, individuals were placed in one of the following four categories—never smoked, ex-smoker, current smoker, or sporadic smoker (for those who report they had never smoked regularly).

Drug Use. Illicit drug use in the past year was included in the analysis as a dichotomous variable, based on participants' "yes" or "no" response to questions asking whether they had taken the following substances in the previous year: cannabis, amphetamines, cocaine, ecstasy, LSD, tranquilizers, crack, and heroin.

Common Mental Disorder. Common mental disorder was assessed with the Revised Clinical Interview Schedule (CIS-R), a structured interview that asks about the following 14 symptom domains (using skips to allow asymptomatic individuals to answer a minimum of 28 questions): fatigue, sleep problems, irritability, worry, depression, depressive ideas, anxiety, obsessions, subjective memory and concentration, somatic symptoms, compulsions, phobias, physical health worries, and panic. The total scores on the CIS-R were dichotomized so that scores ≥12 delineated a mixed depression-anxiety state at a lower threshold than syndromes of major depression and anxiety disorder, but where clinical intervention would be appropriate (Lewis, Pelosi, Araya, & Dunn, 1992).

Long-Standing Illness. Participants were asked the following question: "Do you have any long-standing illness, disability or infirmity—meaning anything that has troubled you over a period of time or that is likely to affect you over a period of time?" Further to this question, participants were asked to specify their long-standing illness or illnesses, as many as they deemed relevant, within a given list of conditions—asthma, chronic bronchitis, other chest trouble, depression, diabetes, stomach or digestive problems, liver problems, rheumatic disorder of arthritis, heart trouble, depression or other nervous illness, high blood pressure, stroke, migraine, back trouble, epilepsy or fits, gynecological problem, irritable bowel syndrome, cancer, and "other"(illness

or condition). This information was used to give further description to the illnesses experienced by participants, but was not included in our regression model.

STATISTICAL ANALYSIS

All analyses were completed in STATA 11 (Stata Corporation, 2008). For the multivariable analyses, we only included data from participants who had complete data on both SAPAS and self-rated health status (n = 1,662). We used survey commands (svy) for estimates of prevalence and associations where appropriate to generate robust standard errors. The reader should refer to Hatch et al. (2011) for further details of the weighting procedure.

We calculated the numbers of subjects overall in the good self-rated health sample and the poor self-rated health sample, respectively, as well as the unweighted frequencies and weighted percentages (within these two groups) with 95% confidence intervals across each of the other measured variables.

We carried out a multivariable logistic regression to estimate odds ratios for the association between self-rated health status and PD screen status, adjusting for potential confounding/explanatory variables. We present crude and adjusted odds ratios with 95% confidence intervals derived from logistic regression models. The first logistic regression model included only PD screen status as an explanatory variable and health status as the outcome variable. All subsequent models included sociodemographic variables. Variables that are considered to be associated with health status on a priori grounds (smoking, BMI and exercise status, hazardous to dependent drinking, drug use, common mental disorder, and long-standing illness) were entered sequentially into a series of regression models in order to examine independence of associations. The final model included all the covariates. We carried out two sensitivity analyses to examine the effect of a unit increase in SAPAS score on the odds of reporting poor health: (a) by replacing the dichotomous exposure (PD screen positive vs. PD screen negative status) in the regression model with SAPAS score, and (b) by excluding data from those screening positively for PD and repeating the regression using SAPAS score.

Finally, we calculated unweighted frequencies and weighted percentages (with 95% confidence intervals) of specific long-standing illnesses reported in our sample, stratified by SAPAS PD screen status.

RESULTS

SAMPLE

In the SELCOH study, from 2008 to 2010, contact was established with 2,070 households out of 3,600 selected addresses. The remaining 1,530 households consisted of 359 unusable (i.e., not residential, not private households, or vacant) addresses, 957 addresses that were approached but no contact was made with household members, 31 duplicates, 16 households already used in a pilot study, and 76 addresses where contact was made with a household

TABLE 1. Sociodemographic and Health Characteristics of Study Sample, Stratified by SAPAS PD Screen Status

	SAPAS PD screen negative sample (n = 1,421)		SAPAS PD screen positive sample (n = 241)	
Characteristics	*n*	Weighted % [95% CI]	*n*	Weighted % [95% CI]
Age group				
16–24	299	18.2 [16.0, 20.6]	56	20.8 [16.1, 26.4]
25–34	351	20.2 [18.0, 22.5]	49	16.1 [12.1, 21.0]
35–44	292	19.4 [17.2, 21.8]	42	15.8 [11.9, 21.0]
45–54	212	14.4 [12.6, 16.4]	41	15.9 [11.9, 21.0]
55–64	128	12.4 [10.4, 14.7]	25	14.8 [10.2, 21.0]
65+	139	15.4 [12.9, 18.3]	28	16.6 [11.7, 23.0]
Gender				
Female	787	65.9 [63.7, 68.0]	155	72.9 [67.4, 77.8]
Male	634	34.1 [32.1, 36.3]	86	27.1 [22.2, 32.6]
Occupational class				
Nonmanual	635	41.5 [38.6, 44.4]	60	22.4 [17.6, 28.2]
Manual	206	14.1 [12.2, 16.2]	33	12.7 [9.0, 17.6]
Not working	552	42.3 [39.3, 45.3]	141	62.2 [55.7, 68.3]
Missing	28	2.2 [1.5, 3.2]	7	2.7 [1.3, 5.6]
Ethnicity				
White	892	64.4 [61.1, 67.6]	142	60.4 [53.5, 66.9]
Black Caribbean	110	7.9 [6.3, 9.9]	30	12.6 [8.7, 18.1]
Black African	208	13.9 [11.7, 16.5]	19	7.5 [4.5, 12.3]
Asian	53	3.5 [2.4, 5.0]	9	4.0 [2.1, 7.6]
Other	157	10.2 [8.5, 12.2]	40	15.1 [11.0, 20.3]
Missing	1	0.1 [0.0, 0.6]	1	0.4 [0.1, 2.9]
BMI				
Underweight	34	2.4 [1.6, 3.4]	5	1.9 [0.8, 4.6]
Normal weight	622	41.2 [38.5, 44.0]	96	37.9 [31.6, 44.5]
Overweight	436	30.0 [27.6, 32.5]	72	28.9 [23.3, 35.2]
Obese	282	22.4 [20.0, 25.1]	53	23.8 [18.5, 30.1]
Missing	47	4.0 [2.9, 5.5]	15	7.6 [4.5, 12.5]
Exercise in last month				
No	583	44.3 [41.3, 47.3]	133	58.0 [51.3, 64.4]
Yes	831	55.0 [52.0, 58.0]	105	40.3 [34.0, 47.0]
Missing	7	0.7 [0.3, 1.6]	3	1.7 [0.5, 5.5]
Long-standing illness				
No	908	59.2 [56.3, 61.9]	99	35.4 [29.5, 41.8]
Yes	512	40.8 [38.0, 43.6]	142	64.6 [58.2, 70.5]
Missing	1	0.1 [0.0, 0.4]	0	0.0
CIS-R common mental disorder				
Fewer than 12	1170	81.8 [79.5, 83.9]	100	40.9 [34.7, 47.5]
12 and above	247	17.9 [15.8, 20.2]	139	58.1 [51.5, 64.5]
Missing	4	0.3 [0.1, 0.7]	2	0.9 [0.2, 4.2]
Drug use in past year				
No	1125	82.5 [80.2, 84.6]	177	76.9 [71.4, 81.7]
Yes	296	17.5 [15.4, 19.8]	64	23.1 [18.3, 28.6]
Alcohol use				
Nonhazardous use	1129	82.5 [80.2, 84.5]	189	79.9 [74.2, 84.6]
Hazardous use	290	17.4 [15.4, 19.6]	51	19.4 [14.8, 24.9]
Missing	2	0.1 [0.0, 0.5]	1	0.8 [0.1, 5.2]
Smoking				
Never smoked	444	32.0 [29.2, 34.9]	62	26.2 [20.7, 32.6]
Current smoker	330	21.7 [19.4, 24.2]	85	33.6 [27.8, 39.9]
Ex-smoker	378	28.6 [26.0, 31.4]	66	28.6 [23.0, 35.0]
Sporadic smoker	269	17.8 [15.8, 19.9]	28	11.6 [7.9, 16.7]
Self-rated health				
Excellent/very good/good	1226	85.0 [82.8, 87.0]	148	58.7 [52.0, 65.1]
Fair/poor	195	15.0 [13.0, 17.2]	93	41.3 [34.9, 48.0]

TABLE 2. Weighted Logistic Regression of Association Between Positive SAPAS PD Screen Status (Score ≥ 4) and Poor Self-Rated Health[1]

	Odds ratio [95% C]
Crude	3.99 [2.93, 5.42]**
Adjusted for sociodemographic factors	3.44 [2.45, 4.83]**
Adjusted for sociodemographics, BMI, and exercise	3.30 [2.32, 4.70]**
Adjusted for sociodemographics and smoking	3.28 [2.33, 4.64]**
Adjusted for sociodemographics and drug and alcohol use	3.31 [2.34, 4.66]**
Adjusted for sociodemographics and long-standing illness	2.72 [1.91, 3.88]**
Adjusted for sociodemographics and common mental disorder	1.91 [1.31, 2.77]**
Adjusted for sociodemographics and all of the above	1.53 [1.02, 2.29]*

Note. [1]Sociodemographic factors include age, gender, occupational class, and ethnicity. $^{**}p < .001$; $^{*}p < .05$.

member but no follow-up contact could be made. Therefore, contact was established with 2,070 private households, of which 1,075 households had at least one member interviewed, representing a 51.9% household participation rate. Of 2,359 people eligible (all adults aged 16 and over) within the participating households, 1,698 (71.9%) participated (mean participants per household = 2.7; *SD* = 1.2). Thirty-six of 1,698 interviewees had missing responses to one or more items of the SAPAS questionnaire and were excluded from our analysis. Of the 1,662 remaining, all had answered the self-rated health question. The sample was similar to the most recent UK Census information in 2001 with regard to demographic and socioeconomic indicators for the catchment area (Hatch et al., 2011). Thus, in our sample of 1,662 participants, 56.7% were female, 45.4% were aged under 35, and those in nonmanual, manual, and not working occupational categories made up 41.8%, 14.4%, and 41.7%, respectively. In terms of ethnicity, 62.2% were White, 8.4% were Black Caribbean, 13.7% were Black African, 3.7% were Asian, and 11.9% were of "other" ethnic background.

PERSONALITY DISORDER SCREEN STATUS

A total of 241 participants (14.5%) screened positively for PD, at a cut-point score of 4 or more on the SAPAS. Table 1 shows the demographic and health characteristics of the sample by PD screen status. PD screen negative and screen positive groups were broadly similar in age and sex distributions, as well as ethnicity. A greater proportion of those in the PD screen positive group were not working (62.2% vs. 42.3% of the screen positive group). Fewer people in the screen positive group (40.3%) had exercised in the last month compared to those in the screen negative sample (55.0%), and a greater proportion of the PD screen positive group were current smokers (33.6% vs. 21.7%). PD screen status was not related to BMI or alcohol status. However, a greater proportion of those screening positively for PD had a long-standing illness or disability (64.6% vs. 40.8%), and also common mental disorder (58.1% vs. 17.9%). In terms of self-rated health, a

TABLE 3. Weighted Logistic Regression of Association Between SAPAS Score (Per Unit Increment) and Poor Self-Rated Health[1]

	Odds Ratio [95% CI]
Crude	1.53 [1.40, 1.67]**
Adjusted for sociodemographic factors	1.48 [1.35, 1.62]**
Adjusted for sociodemographics, BMI, and exercise	1.47 [1.34, 1.62]**
Adjusted for sociodemographics and smoking	1.46 [1.33, 1.60]**
Adjusted for sociodemographics and drug and alcohol use	1.47 [1.33, 1.61]**
Adjusted for sociodemographics and long-standing illness	1.23 [1.11, 1.37]**
Adjusted for sociodemographics and common mental disorder	1.39 [1.27, 1.53]**
Adjusted for sociodemographics and all of the above	1.19 [1.07, 1.33]*

Note. [1]Sociodemographic factors include age, gender, occupational class, and ethnicity. $**p < .001$; $*p < .005$.

greater proportion of PD screen positive participants rated their health as poor (41.3%), compared to those in the screen negative group (15.0%)

SELF-RATED HEALTH

A total of 1,374 respondents (82.7%) rated their health in general to be good (i.e., excellent, very good, or good), and 288 (17.3%) reported this to be poor (i.e., fair or poor). Participants reporting poor health were older than those reporting good health (61.5% aged 45 years or older, vs. 38.8%). A greater proportion of those reporting poor health were not working (66.9% vs. 40.3%), were obese (38.6% vs. 18.9%) and had not exercised in the last month (28.6% vs. 58.4%). Those reporting poor health were more likely to be current smokers (34.3% vs. 21.0%), although there were no major group differences in terms of hazardous alcohol use and drug use in the past year (drug use: 18.0% of poor health group vs. 18.4% of good health group; hazardous alcohol use: 15.3% vs. 16.0%). Unsurprisingly, a greater proportion of those reporting poor health also reported having a long-standing illness (79.2% vs. 36.3%). Of note, more people within the poor health group met threshold for the presence of common mental disorder (55.4% in the poor health group vs. 16.7% in the good health group). A greater proportion of those reporting poor health screened positively for PD on the SAPAS (33.1% vs. 11.1%).

MULTIVARIABLE ANALYSIS

Table 2 displays the crude and adjusted odds ratios, 95% confidence intervals (CI), and p values for SAPAS PD screen status and all the explanatory/confounding variables included in the multiple logistic regression with poor self-rated health as outcome. Participants screening positive for PD were just under four times more likely to report poor health, compared to those screening negative (crude odds ratio 3.99, 95% CI [2.93, 5.42], $p < .001$). Adjustment for age, sex, occupational class, and ethnicity (i.e., sociodemographic factors) did not attenuate this association. The addition of common mental

TABLE 4. Unweighted Frequencies and Weighted Percentages (of Total Population Sample) of Specific Long-standing Illnesses Among SAPAS PD Screen Negative (Score Lower Than 4) Sample and SAPAS PD Screen Positive (Score 4 or Greater) Sample

	SAPAS PD screen negative sample (n = 1,421)		SAPAS PD screen positive sample (n = 241)	
Specific illnesses	n	Weighted % [95% CI]	n	Weighted % [95% CI]
Depression	56	4.7 [3.6, 6.2]	45	19.5 [14.7, 25.4]
Asthma	104	7.6 [6.3, 9.3]	31	14.7 [10.4, 20.3]
Chronic bronchitis	5	0.4 [0.2, 0.9]	3	1.6 [0.5, 4.8]
Other chest problems	13	1.1 [0.6, 2.1]	9	4.6 [2.4, 8.8]
Diabetes	59	5.4 [4.2, 6.9]	14	7.2 [4.2, 12.0]
Stomach/digestive problems	45	3.7 [2.7, 5.0]	15	6.7 [4.0, 10.9]
Liver problems	10	0.7 [0.4, 1.4]	5	2.6 [1.0, 6.3]
Rheumatism/arthritis	95	9.1 [7.4, 11.2]	30	16.7 [11.9, 23.0]
Heart problems	38	3.7 [2.6, 5.1]	13	7.4 [4.3, 12.4]
High blood pressure	120	11.2 [9.3, 13.3]	29	14.9 [10.5, 20.9]
Stroke	8	0.7 [0.4, 1.5]	5	3.1 [1.3, 7.3]
Migraines	33	2.4 [1.7, 3.5]	17	8.1 [5.0, 12.8]
Back problems	80	6.2 [5.0, 7.7]	32	14.5 [10.3, 19.9]
Seizures	6	0.5 [0.2, 1.1]	6	2.5 [1.1, 5.9]
Gynecological problems	24	1.9 [1.3, 2.9]	9	3.7 [1.9, 7.0]
Irritable bowel syndrome	30	2.4 [1.6, 3.4]	4	1.5 [0.6, 4.1]
Cancer	18	1.7 [1.1, 2.7]	5	2.8 [1.1, 6.8]
Other illness	228	18.3 [16.2, 20.7]	73	31.9 [25.9, 38.5]
Reports 3 or more illnesses (excluding depression)	96	8.9 [7.3, 10.7]	40	19.9 [14.8, 26.1]
Reports 3 or more illnesses (including depression)	109	9.9 [8.2, 11.9]	48	22.9 [17.6, 29.2]

disorder to the model considerably attenuated the association (1.91; 95% CI [1.31, 2.77]), although the association remained statistically significant. The addition of long-standing illness as a covariate had a similar (though smaller) attenuating effect, resulting in an adjusted odds ratio of 2.72 (95% CI [1.91, 3.88]). Adjusting for other variables, namely BMI, smoking, drug use, hazardous alcohol use, and exercise, resulted in only small attenuations in the odds ratio. When all covariates were included in the model, the fully adjusted odds ratio remained statistically significant (OR = 1.53, 95% CI [1.02, 2.29], p = .039).

The first sensitivity analysis, which looked at the effect of unit increment in SAPAS score, yielded similar results (crude OR per SAPAS score unit increment = 1.53, 95% CI [1.40, 1.67], p < .001; fully adjusted OR = 1.19, 95% CI [1.07, 1.33], p = .002) (Table 3). The second sensitivity analysis, which looked only at the effect of unit increment in SAPAS score in the PD screen negative sample (n = 1421), also produced comparable results (crude OR per SAPAS score unit increment = 1.48, 95% CI [1.25, 1.75], p < .001; fully adjusted OR = 1.33, 95% CI [1.09, 1.63], p = .006) (data not shown).

PERSONALITY DISORDER SCREEN STATUS AND LONG-STANDING ILLNESS

Table 4 presents unweighted frequencies and weighted percentages (with 95% confidence intervals) of specific long-standing illnesses reported by study participants, stratified by their PD screen status. A greater proportion of people in the screen positive sample reported the following specific illnesses: depression (19.5% vs. 4.7%), asthma (14.7% vs. 7.6%), other chest problems (4.6% vs. 1.1%), rheumatism/arthritis (16.7% vs. 9.1%), migraines (8.1% vs. 2.4%), back problems (14.5% vs. 6.2%), and "other illness" (31.9% vs. 18.3%). Moreover, a greater proportion of people in the screen positive sample reported three or more illnesses; this was the case both when depression was excluded (19.9% vs. 8.9%) and when depression was included (22.9% vs. 9.9%).

DISCUSSION

MAIN FINDINGS

In this representative sample of 1,662 randomly selected London residents, approximately one in seven participants screened positively for PD. Those screening positively for PD were significantly more likely to report poor general health, compared to those screening negatively for PD. This association remained significant after adjustment for a range of covariates and was also observed for those with subthreshold levels of PD symptoms. A greater proportion of those screening positively for PD reported the following specific longstanding illnesses: depression, asthma, other chest problems, rheumatism or arthritis, migraines, back problems, and "other illnesses." We also found that a greater proportion of this sample reported three or more illnesses. For some illnesses, such as chronic bronchitis, liver problems, stroke, and seizures, the number of reporting participants was too small to allow meaningful comparison between the two groups.

STRENGTHS AND LIMITATIONS

The study used a large, representative sample drawn from an urban community setting and took into account a wide range of covariates, including sociodemographic variables, lifestyle and health behavior factors, and presence of common mental disorder and physical conditions. In addition, the sensitivity analyses revealed the significant effect of minor degrees of personality dysfunction on health.

The findings need to be considered in the light of certain limitations. First, the 51.9% household participation rate in the SELCOH study means there is likely to be participation bias, so prevalence estimates need to be interpreted with caution, particularly because those with the most severe mental disorders are least likely to participate in community studies (Knudsen, Hotopf, Skogen, Øverland, & Mykletun, 2010). Despite this, the household participation rate and the 71.9% participation rate among eligible house-

hold members, taken together, were relatively high given the level of deprivation in the area.

Second, we used a brief screen for PD and arguably a more detailed assessment of personality would have allowed us to examine the association more carefully. Against this, the brevity of the screen considerably reduced respondent burden and thus helped to ensure completeness of personality data (obtained on 98% of participants).

Third, we acknowledge the potential for overreporting bias of personality dysfunction among those with active psychiatric illness (Zimmerman, 1994), although self-reports are considered by some authors as concurrently reliable and valid during acute psychiatric illness (Costa, Bagby, Herbst, & McCrae, 2005).

Fourth, the study was carried out in two neighboring boroughs in South East London, and the generalizability of our findings to other communities is uncertain. Finally, the cross-sectional study design limits our ability to make causal inferences or go beyond a theoretical discussion about PD as a determinant of health.

PREVIOUS WORK

To our knowledge, ours is the first study to examine the association between PD and general health in a representative community sample. A number of studies have previously demonstrated a link between PD and various specific health conditions; however, these studies have been limited by their use of clinical or age-specific samples (thus limiting generalizability of findings), or only looked at one health condition. In the Collaborative Longitudinal Personality Disorders Study (CLPS), patients with major depressive disorder and co-occurring PD had significantly more impairment in emotional role limitations, social functioning, and general health perceptions than patients with major depressive disorder and no PD (Skodol, Grilo, et al., 2005). In a study of middle-aged residents in St. Louis, disordered personality predicted worse physical functioning, role limitations, fatigue and pain, even when current health problems and the presence of depression were controlled (Powers & Oltmanns, 2012). In a study of more than 8,000 community-dwelling adults in Great Britain, Moran et al. (2007) found that those at risk for PD were at greater risk for cardiovascular disease, even after adjusting for smoking, alcohol, and other potential confounders (Moran et al., 2007). However, this study did not examine general health and neither did it examine the impact of subthreshold symptoms of PD.

Of note, we found that subthreshold personality disturbance has an important bearing on health—a finding that agrees with other work showing that subthreshold personality disturbance (measured as one criterion less than the *DSM-IV* threshold for personality disorders) is associated with significant handicap (Yang, Coid, & Tyrer, 2010). In a similar vein, Zimmerman, Chelminski, Young, Dalrymple, and Martinez (2012) have reported that among psychiatric outpatients, the presence of one feature of borderline PD alone predicts greater comorbidity, functional impairment, and service use.

POSSIBLE MECHANISMS

A number of mechanisms are likely to underlie the detected association between PD screen status and poor self-reported health. First, personality dysfunction often co-occurs with mental illness such as depression, which in turn predicts poor health (Reiner, 2002). It is therefore possible that the relationship between PD and poor health is mediated by concurrent mental illness. The attenuation of the size of the odds ratio when common mental disorder was added to the regression model provides some support for this explanation.

Second, our findings indicate that people with personality dysfunction are also more likely to have a number of long-standing conditions, ranging from depression to back problems (Table 4). Third, the presence of PD may affect the treatment and prognosis of concurrent medical illness (Frankenburg & Zanarini, 2006). For example, patients with PD and a chronic condition such as diabetes mellitus or end-stage renal disease have been found to behave in a more disordered manner in relation to their illness and may have greater difficulty complying with treatment (Pollock-BarZiv & Davis, 2005; Wuerth, Finkelstein, & Finkelstein, 2005).

Fourth, personality dysfunction may predispose to a poorer relationship with health care services and this in turn may lead to adverse health outcomes. In primary care, PD is associated with frequent and unplanned attendance to general practice, but with fewer referrals to secondary care (Moran, Jenkins, Tylee, Blizard, & Mann, 2000; Moran, Rendu, Jenkins, Tylee, & Mann, 2001). In mental health settings, patients with PD, compared to those without PD, receive greater polypharmacy, which is itself associated with inherent health risks (Bender et al., 2001; Crawford et al., 2011). Fifth, the perception of health may be influenced by personality factors, regardless of the presence of medical problems (Barsky, Cleary, & Klerman, 1992; Goodwin & Engstrom, 2002). Finally, given the cross-sectional nature of these data, it is possible that the direction of causality is reversed and that poor health leads to personality dysfunction.

IMPLICATIONS

We conclude that in the general population, people at risk for PD are at significantly increased risk for poor general health. At a population level, this finding highlights the public health impact of PD, as well as the importance of assessing personality dysfunction at all points of health care service delivery. For mental health practitioners, our findings further emphasize the importance of assessing general health in addition to mental health in those presenting to services. Future research needs to tease out the mechanism underlying the association between PD and health status. Elucidating this mechanism will help us to better understand the dramatically reduced life expectancy of individuals with PD (Fok et al., 2012).

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Chapter 6 Discussion

For ease of reading, the studies in chapters 2, 3, 4 and 5 will henceforth be referred to by abbreviated names, as follows:

- The study in Chapter 2, entitled "Life expectancy at birth and all-cause mortality among people with personality disorder", will be referred to as the *Life Expectancy Study*.
- The study in Chapter 3, entitled "Predictors of natural and unnatural mortality among patients with personality disorder: evidence from a large UK case register", will be referred to as the *Predictors of Mortality Study*.
- The study in Chapter 4, entitled "The impact of co-morbid personality disorder on use of psychiatric services and involuntary hospitalization in people with severe mental illness", will be referred to as the *Service Use Study*.
- The study in Chapter 5, entitled "Personality disorder and self-rated health: a population-based cross-sectional survey", will be referred to as the *Health Study*.

6.1 Summary of findings

The studies in this thesis highlight the public health burden of personality disorder, with respect to health status, mortality and service use. The findings critically underscore the specific vulnerability conferred by an individual's personality dysfunction, both in the community and also in secondary care settings.

Personality disorder is associated with poor physical health. The *Health Study* showed that the association between personality and poor health operates not just in clinical settings as has been previously reported, but also within the community population. Among the community sample, individuals at high risk of personality disorder were significantly more likely to be unemployed, have poorer health-related behaviours, multiple longstanding illnesses, and common mental disorders. However, personality dysfunction appeared to have an independent relationship with poor general self-rated health, over and above these factors. This applied to clinically significant levels of personality dysfunction as well as subthreshold personality dysfunction.

Poor health potentially implicates elevated mortality. The *Life Expectancy Study* found that people diagnosed with personality disorder in secondary mental healthcare experienced a dramatic reduction in life expectancy – by 18 and 19 years -- compared to men and women in the general population, and the overall mortality was four times that of the general population. Young people with personality disorder bore the highest risk – a 10-fold increase in expected mortality, although personality disorder at all ages was associated with increased mortality.

The *Predictors of Mortality Study* gave evidence that this burden of excess mortality is strongly linked to physical causes. In this study, the majority of early deaths in people with personality disorder were deaths from natural causes. The strongest clinical predicting factors of natural deaths were physical illness, and substance and alcohol problems. Specifically, substance and alcohol use problems of a mild degree was significantly associated with natural death. Deaths from unnatural causes were

similarly predicted by substance and alcohol problems, but at levels deemed to be severe. Problems with daily functioning were also significantly associated with mortality from all causes.

Severe mental illness (SMI) typically accounts for a substantial proportion of secondary mental health service use. The *Service Use Study* investigated the added burden of comorbid personality disorder on service use for SMI patients. The study found that SMI patients who had co-morbid personality disorder were significantly more likely to be high users of inpatient services, and were more likely to experience involuntary hospitalization, compared to SMI patients without co-morbid personality disorder. This association was not accounted for by socio-demographic factors and clinical and social functioning variables.

6.2 Personality disorder and mortality

Only five previous studies have examined the relationship between personality disorder and mortality [84-88]. The *Life Expectancy Study* supports this body of literature, and further provides the first comprehensive examination of the life expectancy of secondary mental health service users with personality disorder. Prior to this, a study by Hannerz et al [92] used a Swedish nationwide hospital discharge registry to estimate life expectancies in different diagnostic groups for individuals treated as inpatients. Both men and women with personality disorder had a lower "expectation of remaining life" at all ages, compared to people with schizophrenia and affective psychosis as well as the general population. However, the restriction of that analysis to hospitalised patients and the use of ICD-8 diagnoses limit the application of the findings to present-day secondary care settings. The data from the *Life Expectancy Study* contributes to the literature generally as well as providing UK specific data on life expectancy.

Support for these life expectancy findings emerge in a study published after the work described in this thesis, in 2013, by Nordentoft *et al*, using data derived from a cohort of 270,770 recent-onset mentally ill patients in Denmark, Finland and Sweden [111]. Life expectancy amongst men with personality disorder was found to be between 13 and 22 years lower than that of men in the general population, and that amongst women with personality disorder to be between 15 and 20 years lower than that of women in the general population. These estimates are consistent with those found in the *Life Expectancy Study*.

No previous research has investigated clinical predictors of either all-cause or cause-specific mortality in individuals with personality disorder. Mortality studies in personality disorder have instead almost exclusively investigated deaths from unnatural causes, particularly within borderline personality disorder [94, 95]. In borderline personality disorder, depression, substance use disorder and antisocial personality disorder (or traits) are associated with higher risk of completed suicide [94, 95]. However, despite the increased recognition of natural causes underlying excess mortality in people with mental disorders [96-98], no previous study has investigated deaths from natural causes among people with personality disorder.

The aforementioned Nordic psychiatric case register study by Nordentoft *et al* found that, amongst patients with diagnoses of schizophrenia spectrum disorders, affective disorders, substance abuse or personality disorder, those with substance abuse or personality disorder had the greatest reduction in life expectancy compared to the general population [111]. This chimes with the findings of previous mortality studies in psychiatric populations [80, 82-84]. Both substance abuse and personality disorder are associated with deaths from diseases and medical conditions (i.e. natural causes) and with deaths from suicides, accidents and homicides (i.e. unnatural causes) [84, 111]. In the *Predictors of Mortality Study*, amongst our cohort of patients with personality disorder, we found that a higher score on the HoNOS subscale assessing alcohol or drug use was associated with a two- to three-fold increased risk of death (both natural and unnatural).

Interestingly, further evidence that substance use and personality disorder are a particularly detrimental combination emerges from a study by Bogdanowicz *et al*

[112] (published after the work described in this thesis) which examined the influence of psychiatric comorbidity on excess mortality amongst opioid misusers. This study found that comorbid personality disorder was associated with a two-fold increased risk of all-cause mortality, and almost four-fold risk of death from hepatic disease, compared to opioid misusers without personality disorder. No such association was found with comorbid SMI in this population.

Let us consider the potential mechanism underpinning the association between each of the three identified predicting factors (substance and alcohol use, physical illness, functional impairment) and mortality in personality disorder. Deaths from accidents, homicides and suicides (i.e. unnatural causes) in patients with personality disorder who abuse alcohol and/or illicit drugs might be explained by the acute effects of intoxication leading to greater impulsivity and associated risk-taking behaviour, resulting in fatal accidents or suicide. Similarly, an increased risk of death by violence may also reflect the increased likelihood for involvement in a violent drug-related subculture. Considering natural causes of death, alcoholism is strongly linked with gastrointestinal disease, chiefly cirrhosis and peptic ulceration, whilst drug abuse is associated with viral infections, particularly hepatitis and HIV. It is noteworthy, however, that mild rather than severe alcohol or drug use predicted death from natural causes. One possible explanation for this finding is that substance use rated as mild in severity is more likely to go undetected and untreated. Similar mechanisms may help to explain an association between subclinical depression and mortality in patients with serious mental illness [113]. Another possibility is that those with personality disorder and severe alcohol or drug use who

present to clinical services, represent relatively healthy survivors, which would obscure any association with later mortality risk.

The detected association between all-cause and natural cause mortality with physical illness is unsurprising. Personality disorder is associated with poor health [114], and physical ill-health from unhealthy lifestyles. In addition, undertreated medical conditions, and the harmful side effects of medications -- which are often extensively used by people with personality disorder [115] -- are known to reduce life expectancy in people with mental disorders [116, 117]. Previous studies have reported substantially reduced life expectancy among individuals who self-harm [118], and frequency of self-harm is associated with increased risk of suicide [119]. In contrast, our study found no independent association between the HoNOS subscale on self-harm and mortality. Similarly, although high rates of violent behaviour in individuals with personality disorder are a focus for clinical and public concern [28] and associations have been reported between hostility and mortality in cardiovascular disease [120], we found no association between overactivity and aggression, and mortality. On the other hand, difficulties with activities of daily living (ADL) independently predicted all-cause mortality. Together with the null findings with respect to self-harm and aggression, this is consistent with research showing that self-neglect may be a stronger predictor of mortality than the more obvious risk factors of self-harm or violence [121]. It is also consistent with other research showing that ADL impairment is independently predictive of all-cause mortality among individuals with severe mental illness [122]. ADL impairment is therefore a potentially important marker of vulnerability in individuals with personality disorder. Further investigation is needed to examine the causal pathway

between ADL impairment and mortality in this patient group; potential mediators of this relationship may include chronic social disadvantage, social isolation and poverty (all of which might conceivably result from the reduced opportunities to work and socialise that occur in the presence of ADL impairment).

6.3 Comorbid personality disorder and secondary mental health service use

The *Service Use Study* was the first study to examine the impact of co-morbid personality disorder on both inpatient and community-based mental health service use of adult patients with SMI. Tyrer and Simmonds [62] reviewed the outcome of three randomised controlled trials that investigated different models of care in SMI and found, in post-hoc analyses, that patients with co-morbid personality disorder spent more time in hospital compared to those without co-morbid personality disorder, regardless of the model of care. Keown and others investigated psychiatric bed use amongst SMI patients seen in a UK community mental health team, and found that the concurrent presence of personality disorder and also severity of personality disorder were associated with increased psychiatric bed use amongst SMI patients [61, 62]. My finding in this study that co-morbid personality disorder increases inpatient service use in SMI patients is consistent with these studies, and chimes with existing evidence that co-morbid personality pathology worsens outcomes in SMI [24, 56, 57, 59, 60, 123]. The SMI-PD (i.e. SMI with comorbid personality disorder) patient group was characterised by a number of factors known to contribute to increased psychiatric service use, i.e more severe psychopathology [59], higher levels of aggression [124] and self-injury [125], greater problems with alcohol and drug use [126, 127], greater problems with housing [124] and

occupation, and less stable relationships [128, 129], compared to the SMI group. However, adjustment for these potential confounders had little effect on the strength of the association with inpatient service use.

Based on previous work on patients with personality disorder and co-morbid personality disorder [105, 109], one may have expected a similar pattern with regard to community-based services. In this respect, however, the findings of the *Service Use Study* were inconclusive. Although no other study has examined both inpatient and community-based service use in adults with a dual diagnosis of SMI and personality disorder, a recent study in adolescents with Axis I psychiatric disorders [110] found that those with co-morbid personality disorder used more inpatient and emergency, but comparable outpatient, psychiatric services, compared to those without co-morbid personality disorder.

6.4 Comorbid personality disorder and involuntary hospitalization

No study has previously examined the impact of co-morbid personality disorder on the risk of involuntary hospitalization in patients with SMI. In the *Service Use Study*, the combination of personality disorder in the presence of SMI independently increased the risk of involuntary hospitalization. Compared to the SMI group, the SMI-PD group had a higher proportion of individuals with severe clinical problems in five of eight clinical domains, including aggression [130] and non-accidental injury. Levels of social dysfunction were also higher among the SMI-PD group compared to the SMI group. Thus factors associated with increased risk to self and/or others (a criterion for involuntary detention under the English Mental Health Act) were more prevalent in the SMI-PD group compared to those with SMI alone.

These factors are very likely to be on the causal pathway to involuntary hospitalization for those with co-morbid personality disorder. The attenuation in the size of the odds ratio, which occurred when these covariates were added to the model, provides some support for this argument. A diagnosis of personality disorder alone was associated with a lower likelihood of detention in hospital. This is consistent with recommended clinical practice [131], as there is no evidence base to suggest that compulsory treatment in hospital for people with personality disorder improves clinical outcomes.

6.5 Personality disorder and health in the general population

The *Health Study* is the first study to examine the association between personality disorder and general health in a representative community sample. A number of studies have previously demonstrated a link between personality disorder and various specific health conditions; however, these studies have been limited by their use of clinical or age-specific samples (thus limiting generalizability of findings), or by the fact that they have only looked at one health condition.

Of note, the *Health Study* found that subthreshold personality disturbance has an important bearing on health – a finding which chimes with other work showing that subthreshold personality disturbance (measured as one criterion less than the DSM-IV threshold for personality disorders) is associated with significant handicap [51]. In a similar vein, Zimmerman *et al* have reported that amongst psychiatric outpatients the presence of one feature of borderline personality disorder alone predicts greater comorbidity, functional impairment and service use [132].

A number of mechanisms are likely to underlie the detected association between personality disorder screen status and poor self-reported health. Personality dysfunction often co-occurs with mental illness such as depression, which in turn predicts poor health [133]. It is therefore possible that the relation between personality disorder and poor health is mediated by concurrent mental illness. The attenuation of the size of the odds ratio when common mental disorder was added to the regression model provides some support for this explanation.

The findings from the *Health Study* indicate that people with personality dysfunction are also more likely to have a number of longstanding conditions, ranging from depression to back problems. Related to this, the presence of personality disorder may affect the treatment and prognosis of concurrent medical illness [25]. For example, patients with personality disorder and a chronic condition such as diabetes mellitus or end-stage renal disease have been found to behave in a more disordered manner in relation to their illness and may have greater difficulty complying with treatment [134, 135].

Furthermore, an underlying psychological characteristic in people with personality disorder may render them more vulnerable to physical illness such as cardiovascular disease [69]; possible candidates for this underlying characteristic include negative affectivity [136], affective instability [137], and hostility [138]. Personality dysfunction may predispose to a poorer relationship with healthcare services and this in turn may lead to adverse health outcomes. In primary care, personality disorder is associated with frequent and unplanned attendance to general practice, yet fewer referrals to secondary care [33, 103]. In mental health settings, compared to those

without personality disorder, patients with personality disorder receive greater polypharmacy, which is itself associated with inherent health risks [105, 115]. The perception of health may be influenced by personality factors, regardless of the presence of medical problems [72, 139]. Finally, given the cross-sectional nature of these data, it is possible that the direction of causality is reversed and that poor health leads to dysfunctional personality change, or alternatively, that poor health colours the self-description of personality (i.e. reporting bias), leading to a greater risk of reporting personality disorder traits.

6.6 Methodological considerations

There are a number of methodological considerations that need to be considered in the interpretation of the findings in all four studies.

6.6.1 Studies using CRIS

The *Life Expectancy Study*, *Predictors of Mortality Study* and *Service Use Study* were all historical cohort studies that used a routine clinical database. The main advantage of this design is access to a large clinical cohort derived from a secondary mental health setting which included the full range of inpatient and community-based services, as well as a wide range of clinically important outcome and covariate data. However, certain limitations inherent in the use of such a database need to be recognised.

First, all three studies relied on ICD-10 diagnoses as opposed to standardised assessments. Against this, the use of routinely-collected clinical data allowed me to obtain data on a very large sample size, thus optimising the precision of my findings. Moreover, the use of routine clinical diagnoses in a very large population favours generalisability to real clinical practice. In addition, I established an acceptable level of reliability between the case register diagnoses of personality disorder and blind clinical ratings, obtaining kappa of 0.72 (p <0.001).

Second, routinely collected clinical data may contain measurement error, which applies to demographic and socioeconomic variables as well as clinical variables

such as HoNOS items. However, we would expect that any measurement error would be essentially random, so unlikely to introduce systematic bias.

Finally, it is known that a large number of people with personality disorder do not present to mental health services and are either managed in primary care or within general medical services. Findings from the *Life Expectancy Study*, *Predictors of Mortality Study*, and *Service User Study* therefore are principally generalizable to secondary mental health service users.

6.6.2 The mortality studies

The two mortality studies both had potentially important unmeasured confounders. In the *Life Expectancy Study* these included socio-economic status, comorbid psychiatric and physical conditions and substance misuse. In the *Predictors of Mortality Study*, frequency and intensity of service contact, and possible effects of pharmacological or psychosocial interventions were not considered. Level of service contact and interventions may have a bearing on symptoms and health [140], either positively or negatively, which can contribute to mortality risk. Other variables that were unaccounted for were duration of illness and smoking status.

Despite having good sample sizes, both mortality studies had insufficient statistical power to examine more fine-grain associations, such as that between personality disorder clusters and mortality, and that between clinical variables and more specific causes of death.

The *Life Expectancy Study* used national data as a comparison, which might not be representative of the local population in South East London. To address this, I carried out a sensitivity analysis, standardising with mortality statistics for London alone. The point estimates for SMRs obtained in this sensitivity analysis were not substantially different from those obtained with national data.

6.6.3 The Service Use Study

In the *Service Use Study*, the historical cohort design meant that in some cases, the diagnosis of co-existing personality disorder was made during the course of, or in some cases, towards the end of the individual's observation period. This, together with my cross-sectional analysis, limits my ability to make causal inferences (between comorbid personality disorder and high service use).

Furthermore, the relatively low prevalence of co-morbid personality disorder in the SMI cohort (8.1%), stands in contrast with prevalence rates reported in other studies [18, 35, 141, 142] and indicates that there was under-detection of personality disorder in the sample [123, 143]. On the other hand, it is possible that some cases of personality disorder were misclassified and that the probability of this occurring was dependent upon service use (i.e. that heavy users of services were more likely to attract a diagnosis of personality disorder). If this is the case, then it is possible that the strength of association between co-morbid personality disorder and heavy service use was over-estimated.

Although there was incomplete data in some models in this study, it is unlikely to explain the observed associations, as there was little variation in results across the

regression models. In addition, incomplete data was not unevenly distributed among the exposure groups of interest (SMI and SMI-PD).

6.6.4 The Health Study

The *Health Study* used a large, representative sample drawn from an urban community setting, and took into account a wide range of covariates, including sociodemographic variables, lifestyle and health behaviour factors, as well as presence of common mental disorder and physical conditions. However, this study also had its limitations. First, the 51.9% household participation rate in the SELCOH study means that participation bias was likely present, so prevalence estimates need to be interpreted with caution, particularly because those with the most severe mental disorders are least likely to participate in community studies [144]. Despite this, the household participation rate and the 71.9% participation rate among eligible household members, taken together, were relatively high. Second, a brief screen was used for personality disorder and arguably a more detailed assessment of personality would have allowed me to examine the association more carefully. Against this, the brevity of the screen considerably reduced respondent burden and thus helped to ensure completeness of personality data (obtained on 98% of participants). Third, as acknowledged above, poor health may colour the self-description of personality (i.e. reporting bias), leading to over-reporting of personality disorder traits [8]. Notwithstanding, self-reports of personality are generally considered to be concurrently reliable and valid during acute psychiatric and medical illness [145]. Fourth, the study was carried out in two neighbouring boroughs in South East London, and the generalizability of the findings to other communities is uncertain. Finally, the cross-sectional study design limits my ability

to make causal inferences or go beyond a theoretical discussion about personality disorder as a determinant of health.

6.6.5 Personality disorder exposures across the studies

Lastly, it is important to note that different approaches were used to capture personality status across the studies. Whilst the CRIS studies (i.e. the *Life Expectancy Study*, the *Predictors of Mortality Study* and the *Service Use Study*) used routine clinical diagnosis to identify people with personality disorder in a clinical population, the *Health Study* made use of a standardized, structured instrument to assess personality dysfunction in a community sample. Thus the reader is advised not to interpret the personality disorder exposures between these studies as entirely overlapping or continuous constructs.

6.7 Implications for clinical practice and future research

The findings in this thesis contribute substantially to knowledge about the burden of personality disorder in secondary mental health services and also in the general population. The findings highlight the public health impact of personality disorder, and point to the critical importance of routinely assessing personality status at all points of healthcare service delivery. The finding that even subthreshold personality dysfunction can have implications for health, should encourage clinicians across all sectors (including primary care, emergency services, and secondary services) to always consider personality factors when meeting the needs of help-seeking individuals. For mental health practitioners, the findings regarding personality disorder and health emphasize the importance of assessing general health in addition to mental health in those presenting to services. Future research needs to tease out the mechanism underlying the association between personality disorder and health status.

The identification of specific risk factors with respect to mortality in personality disorder has clear implications for clinical practice. The physical health status of patients with personality disorder should be regularly reviewed. Such a basic principle of medical care cannot be overstated. Compared with members of the general population, people with mental health problems receive poorer physical healthcare [146] and within this population, individuals with personality disorder are among the most poorly served, in part because they are often perceived to be 'difficult' [147] and thus not deserving of care [148].

Functional impairment is an enduring feature of most forms of personality disorder [49] and, given the evidence from this thesis of its association with early mortality, should be a central component of the clinical assessment of people with suspected personality disorder. Furthermore, apparently mild problems with drugs and alcohol was the strongest predictor of mortality to emerge from the *Predictors of Mortality Study*, confirming the importance of taking a careful alcohol and drug history from all personality-disordered patients, including those without conspicuous alcohol- and drug-related problems [113, 121]. In summary, clinicians need to pay greater attention to the physical health status, drug and alcohol use, and functional status of their patients with personality disorder.

Amongst patients with SMI, the co-existence of personality disorder was found to be independently associated with both high use of inpatient psychiatric services and an increased likelihood of involuntary hospitalization. This fact, together with the tendency for under-diagnosis of co-morbid personality disorder, again highlights the importance of routinely assessing personality status in all individuals presenting to secondary mental health services, with or without Axis I disorders. Patients with SMI and co-morbid personality disorder are likely to require tailored interventions that target both the underlying personality pathology as well as the Axis I disorder. In this respect, the use of crisis plans and assertive outreach models may help to reduce admissions and involuntary hospitalization for patients with SMI and co-morbid Axis II pathology [35, 62, 149].

6.8 Conclusions

In conclusion, the findings of this thesis provide evidence of the burden of personality disorder in secondary mental health services and in the general population. In particular, personality disorder or personality dysfunction is independently associated with poor health, increased mortality and significantly reduced life expectancy. Amongst people with personality disorder, the most risky subset with respect to mortality, are those with alcohol and drug problems, poor physical health, and severe functional impairment. Co-morbid personality disorder in severe mental illness, which often goes undiagnosed, is independently associated with both high use of inpatient psychiatric services and an increased likelihood of involuntary hospitalization. These findings provide a strong rationale for routinely assessing personality status in individuals presenting to general health services *and* mental health services. The findings also indicate that clinicians and services should pay greater attention to the areas of physical health, drug and alcohol use, and functional impairment among people with personality disorder. To not do so, runs the risk of missing valuable opportunities for intervening with this evidently vulnerable population.

Chapter 7 References

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